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ABSTRACT

This study used the Learning Style Inventory by Dunn, Dunn, and Price to identify learning style variables among school students in isolated Northeastern Manitoba communities. The importance of these learning styles to educational practice is discussed. The study sample consisted of Cree-speaking students enrolled in grades 4 through 10 at 3 randomly selected schools in Northeastern Manitoba. The Learning Style Inventory was administered to 422 students. The results indicated that 18 learning style variables were preferred by 25% or more of the students. There were no learning style variables which were preferred by all the students. Significant differences in learning style were found: among students in the three study sample schools; between males and female students; among students at different grade levels; among excellent, average, and below-average students; and among students with high, medium, and low school attendance rates. The importance of the identified learning styles focuses on four areas. First, although learning style trends were identified, all students were not described by these trends. Attention should be given to individual and group learning styles. Second, the results of this study are not readily generalizable to all Cree-speaking students. Third, student achievement would probably be accelerated had attention been given to the learning style differences noted. Fourth, below-average students and students with low rates of attendance may have learning styles which are not fully considered. Attention to the learning styles of these students may improve their achievement and attendance. (Author/TES)

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IDENTIFICATION OF LEARNING STYLES EXISTENT AMONG STUDENTS ATTENDING SCHOOL IN SELECTED NORTHEASTERN MANITOBA COMMUNITIES

A MAJOR THESIS PRESENTED TO
THE FACULTY OF GRADUATE STUDIES AND RESEARCH

THE UNIVERSITY OF MANITOBA

IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF

MASTER OF EDUCATION

BY

LEONARD JAMES MARIASH

WINNIPEG, MANITOBA
AUGUST, 1983

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IDENTIFICATION OF LEARNING STYLES EXISTENT AMONG STUDENTS ATTENDING SCHOOL IN SELECTED NORTHEASTERN MANITOBA COMMUNITIES

BY

LEONARD JAMES MARIASH

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF EDUCATION

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a Master's thesis entitled: "IDENTIFICATION OF LEARNING STYLES EXISTENT AMONG STUDENTS ATTENDING SCHOOL IN SELECTED NORTHEASTERN MANITOBA COMMUNITIES"

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ABSTRACT

IDENTIFICATION OF LEARNING STYLES EXISTENT AMONG STUDENTS ATTENDING SCHOOL IN SELECTED NORTHEASTERN MANITOBA COMMUNITIES

by

LEONARD JAMES MARIASH

This study identified, through the use of the Learning Style Inventory, variables of learning style that are existent among students attending school in selected isolated Northeastern Manitoba communities. The importance of these learning styles to educational practise was discussed.

The study population consisted of 1111 Cree-speaking students enrolled in grades four through ten in seven schools in Northeastern Manitoba communities. The study sample consisted of grades four through ten students attending three randomly selected schools.

The Learning Style Inventory (1978 edition) by Dunn, Dunn and Price was administered to 422 students who were present during test administration. The student responses were computer scored and were

analyzed in response to six study questions.

The results indicated that there were 18 learning style variables which were preferred by 25 percent or more of the students. There were no learning style variables which were preferred by 100 percent of the students. Significant differences in learning style were found as follow: among students in the three study sample schools; between male and female students; among elementary, junior high and senior high students; among excellent, average, and below-average academic achievement students; and among students with high, medium, and low school attendance rates.

The importance of the learning styles identified focuses on four areas. Firstly, although learning style trends were identified, all students were not described by these trends. Attention should be given to individual and group learning styles. Secondly, the results of this study are not readily generalizable to all Cree-speaking students as there were learning style differences among students in the three study sample schools. Thirdly, student achievement would probably be accelerated were attention given to the learning style differences noted. Fourthly, below-average students and students with low rates of school attendance may have learning styles which are not fully considered. Attention to the learning styles of these students may improve their achievement and attendance.

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CHAPTER I

INTRODUCTION

Introduction and Importance of the Study

The proverbial invitation to walk a mile in another person's moccasins in order to know that person is a good description of the theme of this study. The statistics on school attendance rates and student retention and graduation rates that follow very clearly show that Canadian Indian children have not been particularly successful in school. This study suggests one method for improving their education.

Hawthorn (1967) estimated that during the period 1951-62, there had been a 94 percent loss of Canadian Indian students between grades one and twelve. Saigaonkar (1975) reported that only 5.44 percent of the total number of 1974-75 Indian school leavers were graduates, although a further 8.18 percent gained promotional credits insufficient to earn them graduation.

Kirkness (1973) estimated that in Manitoba only 10.8 percent of those Indian children who began grade one in 1967-68 would reach grade twelve as compared to 90.9 percent of all Manitoba children. Saigaonkar (1975) reported that Manitoba schools operated by the Department of Indian Affairs had the lowest student retention rates in Canada. The magnitude of this problem is illustrated by the fact that only 0.93 percent of the 1973-74 Manitoba Indian school leavers

were graduates (Saigaonkar, 1975).

Attendance in Department of Indian Affairs schools in Manitoba continues to be a problem. The Department of Indian Affairs (1983) reported that school attendance levels for the schools it operates in Manitoba were 71 percent in 1975-76, 75 percent in 1977-78, 78 percent in 1978-79, and 79 percent in 1979-80. In another illustration of low attendance, the Department of Indian Affairs (1981) reported that 7.4 percent of the total eligible Indian student population in Manitoba had not enrolled in school in 1980-81.

Interest in a study of the learning style of Indian students was generated by Fuchs and Havighurst (1972) as well as Bradshaw and Renaud (1967). Research by Slentz and Leith (1976) also seemed to indicate that there were preferable teaching methods to be used for teaching Indian students. In a review of Indian education in the United States of America, Fuchs and Havighurst (1972) mentioned that in order to improve Indian education, Indian "styles of learning" must be accepted, although no definition was made of the meaning of "styles of learning" other than group cooperation and respect for elders and tradition. Bradshaw and Renaud (1967) offered a sympathetic view of the Saskatchewan Indian child and culture, and described some learning characteristics; that is, their society was seen as a silent society in which observation and experience intuitively interacted in any learning situation.

Interest in a study of learning styles of children as a

means of improving their education was furthered by Dunn and Dunn (1977) through a reference to to the Learning Style Inventory. This suggested to this writer the possibility that Cree-speaking students may have an identifiable learning style.

The work by Dunn and Dunn (1979 a:111) on teaching students to become more effective learners through their specific learning styles stimulated this study. Specifically, Dunn and Dunn (1979 a) stated that some outcomes of allowing students to learn in ways that were natural to them are: increased academic achievement, improved basic skills, improved self-esteem, a liking for learning, stimulated creativity and gradually increasing learner independence. Conversely, where students were expected to match their learning style with the teachers' teaching style, learning can become more difficult, academic progress can suffer, frustration can be caused, and the student's self-confidence can decrease.

The administration of tests or inventories was deemed advisable by Keefe (1979). He suggested that general learning style trends could be identified for a group of students. Teachers could then modify their teaching methodology to accommodate the students' learning style. Similarly, Dunn and Dunn (1979 b) suggested that if teachers could match their teaching styles with their students' learning styles, greater educational progress could be the result.

The converse situation described above appeared to be the case for the Indian students of Manitoba; these students have been marginally successful with the present educational system. It appeared that a description of the learning styles of Cree-speaking

students could be of importance to their education.

This study focuses on identifying the learning style of Cree-speaking students in Northeastern Manitoba, an attempt to understand them, an attempt to walk that mile.

Statement of Problem

This study will identify, through the use of the Learning Style Inventory, variables of learning style that are existent among grades four through ten students attending school in isolated communities of Northeastern Manitoba. In addition, an attempt will then be made to relate these learning styles to prevailing educational practise and to discuss their implications generally.

Questions to be Answered

The study will address the following questions:

1. Are any variables of learning style sufficiently prevalent to be important for educational practise for the study population?
2. Are there learning style differences among the three study sample schools used in this study?
3. Are there learning style differences between the male and female students?
4. Are there learning style differences among elementary grade students, junior high students, and senior high students?
5. Are there learning style differences among students whose academic achievement is excellent, students whose academic

achievement is average, and students whose academic achievement is below-average?

6. Are there learning style differences among students whose school attendance is high, students whose attendance is medium, and students whose school attendance is low?

Assumptions

The assumptions that underlie this study are:

1. Learning style is a characteristic of school children which can be identified within the limits of the Learning Style Inventory.
2. Learning style is a unique characteristic of each child.
3. Learning style can be identified by the individual student (Price, Dunn and Dunn, 1977: 2).

Limitations to the Study

Limitations to this study are:

1. This study tested only those students in grades four through ten who were present during test administration.
2. The Learning Style Inventory tested the student's perception of his/her learning style at a particular time.
3. Individual results with a consistency score less than 70 percent were not included in the analysis (Dunn, Dunn and Price, 1975: 5).
4. This study did not test non-school attenders.
5. This study required that the students have sufficient

reading and comprehension skills to answer the Learning Style Inventory questionnaire with a minimum of assistance.

Delimitations to the Study

For this study, the following delimitation is recognized:

1. The study population consisted of Cree-speaking students in grades four through ten who were enrolled at schools in selected isolated communities of Northeastern Manitoba.

Definition of Terms

The following are definitions as they were used in this study.

Academic Achievement Categories: The term of below-average, average and excellent were used to define academic achievement. These terms are relative to each other and are based on the student's general academic achievement as determined by the classroom teacher.

Consistency: The consistency score determined how carefully students responded to the questions. Ten questions were repeated throughout the Learning Style Inventory and a percentage was calculated for each student based on the number of pairs of questions answered in the same way (Dunn, Dunn and Price, 1975).

Isolated Community: A community that is normally inaccessible except by air transport.

Learning Style: refers to the manner in which at least eighteen different areas of four basic stimuli (immediate environment, own emotionality, sociological needs, and physical needs) affect a person's ability to absorb and to retain information, values, facts, or concepts (Dunn and Dunn, 1975: 74).

Learning Style Area: The Learning Style Inventory centers on 24 factors which identify the individual learning style. Each of these factors is a learning style area.

Learning Style Variable: An individual may have a high preference or a low preference for each of 24 learning style areas or a possible 48 preferences. Each of these possible preferences is termed a learning style variable.

School Attendance Categories: The terms of high, medium, and low were used to describe school attendance and are based on the student cumulative percentage attendance since the student enrolled in school. Students with cumulative percentage attendance 80 or higher were placed in the high attendance category, students with cumulative percentage attendance lower than 80 but not lower than 60 were placed in the medium attendance category, and students with cumulative percentage attendance lower than 60 were placed in the low attendance category.

School Grade Categories: The terms of elementary, junior high, and senior high were used to describe the grade categories where students in grades 4, 5, and 6 were in the elementary

category, students in grades 7 and 8 were in the junior high category, and students in grades 9 and 10 were in the senior high category.

Organization of the Thesis

Presented in Chapter I was the importance of the study, a statement of the problem, and a description of questions to be answered by the study. Assumptions, limitations, delimitations, and definition of terms followed.

Chapter II includes a review of the literature on learning styles of North American Indian children as well as a review of the literature on learning style and use of the Learning Style Inventory. Research reports on experiments dealing with teaching methods are discussed.

In Chapter III, the overall methods of the study are described in detail. Specifically, the instrument used, the population and sample, the administration of the instrument, the data collected, and the treatment of the data are described.

The analysis of this data and the findings based on this data are presented in Chapter IV.

A summary of the study, conclusions, implications for educational practise and recommendations for future research are contained in Chapter V.

CHAPTER II

LITERATURE REVIEW

This literature review concentrates on three aspects of learning style relevant to this study. The first aspect centres on learning styles of Indian children from some cultural groups, the second aspect centres on experiments with methods of instruction, and the third aspect centres on the Learning Style Inventory. The findings are summarized.

Learning Style of Indian Children From Some Cultural Groups

This section deals with the relationship of learning style with culture, with anecdotal reports on the learning style of Indian children from some cultural groups, with research reports on the learning style of Indian children from some cultural groups, and with successful methods for teaching Indian children from some cultural groups.

Relationship of Learning Style With Culture

The purpose of this subsection is to establish the nature of the relationship of learning with culture. Four references are cited.

An extensive review of the contentious issues involved in the relationship between culture, language, environment, and learning is beyond the scope of this study. This study is not a cross-cultural study; data related to only one cultural group are presented; it only looks at students within their own cultural setting, using the "emic approach" (Berry, 1969: 123), in which the criteria examined are relative to internal characteristics rather than to absolute or universal characteristics.

In a review of the literature on the relationship between culture and perception, Harrington (1974) summarized current research generalizations. In the first place, the content of perception (what is perceived) is culturally determined and culturally learned. Differences in perception between peoples of different cultures are not based on assumptions of biological differences. Secondly, perceptual styles, emphasis and skills are also culturally determined and not biologically determined. Thirdly, the studies reviewed seemed to demonstrate that it was important for the student of education to understand how these cultural factors operate to influence the content and process of perception. Finally, many studies provided specific information about the content and process of perception in particular cultures.

The "cognitive unity of mankind" was emphasized by Harrington (1974: 25) in his review of literature on the relationship of cognition with culture, which means essentially that thought processes do not differ from culture to culture. What differed was the content (what is thought about), situations (the

conditions that affect that thinking) and the premises that are accepted as true or binding.

Modiano (1970: 8) reviewed a large number of studies on cognitive development in various cultures. She reported that these studies have "... clearly shown culturally determined variations in cognitive style," implying that these variations are thought to be differences in the content of cognition.

Cole and Gay (1976: 322) addressed the question, "Do bearers of different cultures think differently?" In order to answer this question, they "... found it useful..." to make a distinction between the content of cognitive ability, that is "what" people think about, and the cognitive processes involved in thinking, that is "how" people think. The content of cognitive ability was seen to be different among people of the various cultures simply because of environmental and cultural value differences. They could not, however, reach a definite conclusion with regard to the cognitive processes involved in thinking although they were inclined to suggest that the cognitive processes involved in thinking were similar.

Berry (1971: 325) presented the approach of "... the behavioural adaptation to ecological pressures..." on the role of the environment in shaping human behaviour. This model for human behavioural development was interactional rather than causal. The environment acted as a stimulus on the individual while the individual potentially transformed his environment. The mediating factors of culture, socialization, nutrition and disease, and gene

pool, were important determinants in this interaction between environment and individual in the individual's development. Interaction between the individual and his ecological environment was emphasized.

Berry (1971: 328) described the learning style of people from a hunting society. He states that:

> ... hunting people are expected to possess good visual discrimination and spatial skill, and their cultures are expected to be supportive of the development of these skills through the presence of a high number of "geometrical spatial" concepts, a highly developed and generally shared arts and crafts production, and socialization practises whose content emphasized dependence and self-reliance, and whose techniques are supportive and encouraging of separate development.

Generally, large differences in cognition and perception were found among different cultural groups. These differences were found in the content of cognition and perception rather than the processes involved in cognition and perception. People in all cultures appear to use the same thought and learning processes; they only think and learn about different things. These differences are not thought to be biologically or environmentally determined; they appear to be the result of an individual's interaction with his culture and ecological environment. People from a hunting society appear to develop individuals with specific hunting culture oriented skills.

Anecdotal Reports on the Learning Styles of Indian Children From Some Cultural Groups

The purpose of this subsection is to demonstrate that various observers have commented that American Indian children from

various cultural groups have specific learning styles. Eight references are cited.

Bradshaw and Renaud (1967) described learning characteristics of Saskatchewan Indian children. Indian society was seen as a "silent society." Their culture has nurtured an intuitive awareness which can be destroyed by speech. They suggested that classroom instruction would be enhanced by use of visual methods of presentation rather than by verbal methods.

Observation and experience were other aspects of the Indian learning style. Indian children were said to have "... keen powers of observation, especially with regard to detail, ability to select essentials from non-essentials, and, more important, a highly developed instinct for fathoming the inherent qualities of nature" (Bradshaw and Renaud, 1967: 9). Learning was seen as an intuitive process. Other important aspects were respect for tradition and elders and sharing. There was a great esteem for elders and for the knowledge they imparted by example and by word. Material goods were commonly shared among all people.

In a review of Indian education in the United States, Fuchs and Havighurst (1972: 221) mentioned that Indian "... styles of learning..." must be accepted. Specifically, group cooperation and respect for history and tradition were mentioned as elements of Indian learning styles.

McLean and Jamieson (1972) described a conflict between the learning style of Indian children and the learning style imposed by the school. Specifically, McLean and Johnson (1972: 19) quoted

McKinley et al:

> "Our own field data indicate that Indian children prefer the style of learning characteristic of their culture. Generally the learner initiates an extended period of observation and attempts performance only when he feels fairly certain of his ability. Premature bungling attempts are met with teasing, and successful attempts with quiet acceptance. The characteristics of learning in the American classroom (i.e., initiation by the teacher, premature public practice, public praise, and public correction) are all antithetical to this aboriginal style.... Modern American Indian children prefer self-directed and self-initiated projects, ungraded curricula, and learning activities which can be completed with minimum interaction between student and teacher, except when the interaction involves friendly help on an individual basis." (19)

McLean and Jamieson noted that many schools did not adjust their curricula and teaching methods to match the learning styles of Indian children. Indian student withdrawal and refusal to participate resulted where this adjustment was not made.

Some cognitive strengths of Alaskan native students were described by Kleinfeld (1973). Kleinfeld noted that these characteristics probably resulted from native lifestyle requirements. These strengths were: highly developed visual skills and spatial abilities; highly developed ability to memorize visual patterns; and social skills that were described as friendly, helpful and cooperative. Kleinfeld suggested that teacher instruction would have greater success if visual methods of presentation such as diagrams, films, etc., were used and if the classroom instructional climate was highly personalized, friendly and relied heavily on small groups.

Cultural discontinuity between home and school were stressed by Sindler (1974). The regimentation of the school, albeit a boarding school in the study cited, was so antithetical to the student's home lifestyle that the student rarely adjusted to school requirements and rarely succeeded academically. Specifically, Sindler mentioned four aspects of the Mistassini Cree student learning style. These aspects were: exploratory behaviour with emphasis on freedom of action, self-reliance and independence; high degree of social stimulation; cooperative task performance; and inhibition of aggression.

The difference between the learning style of Indian and Metis students and the teacher's teaching style was also described by Grant (1976: 109):

> The native person waits and watches until he is sure, then acts. What if there is nothing for the child to observe? In instructions and teaching verbal forms are the most frequently used. The speed of the speaker is too fast for the child's comprehension. The style is not his familiar neighbourhood style. Teachers frequently repeat themselves but say it in a slightly different way the second time. Native children often do not learn as much by listening as do white children because their auditory skills are not as well developed. The one way in which they learn best, through observation, is employed less frequently by teachers than are auditory methods.

Kirkness (1976) stated that education for Indian students should utilize the concept of cultural relevance to obtain its academic ends. Furthermore, education for Indian children should encompass traditional patterns of learning which emphasized independence, self-reliance, observation, discovery, practicality, and a respect for nature.

Freark and LeBrasseur (1982: 9) noted some generalities that applied to the education of most Indian groups. High levels of classroom competition were negatively related to school achievement. Competition was better directed towards a standard of excellence rather than among peers. Emphasis was better placed on cooperation than on competition. Peer influence was another important factor in academic performance.

General patterns in the learning styles of Indian children from various cultural groups were noted in the anectodal reports. These are:

1. Learning style is said to be observational and visual rather than verbal. Visual skills and memory skills were highly developed;
2. Learning through language was traditionally important for transmitting oral history;
3. There was respect for elders and tradition;
4. Socialization patterns were not aggressive. Teasing was generally used to enforce compliance. Exploratory behaviour, independence and discovery were encouraged;
5. Cooperative sharing, friendliness and helpfulness were stressed; and
6. Actions were attempted only after there was certainty of success.

A common trend in the anecdotal reports was the conflict between Indian student learning styles and school teaching styles. This conflict was generally not resolved.

Research Reports on Learning Styles of Indian Children from Some Cultural Groups

The purpose of this subsection is to demonstrate that educational research appears to have confirmed the verity of the anecdotal reports of specific Indian learning styles. Nine references are cited.

In a study of the general intellectual potential and differential abilities of Eskimo, Indian, Metis and non-native students in the Mackenzie District, North West Territories, MacArthur (1968 a, 1968 b) reported that native students achieved better in non-verbal abilities and in verbal memory abilities, relative to their non-native classmates, than in written and oral English comprehension. As they grew older, the native students slipped steadily behind their non-native classmates in most educational abilities, especially those of a verbal comprehension nature. MacArthur suggested that in order to improve the educational status of native students more emphasis be placed on written and oral comprehension and expression of English as the subject of instruction. More use of non-verbal stimuli as media of instruction should also be made.

Using the same data as the 1968 b study, MacArthur (1969) further observed that there were no sex differences in the development of the cognitive development of the groups studied.

In a report on Indian learning, recognized by Modiano (1970: 19) as one which summarized and codified much of the research on Indian learning styles, Cayden and John (1969, 1971) described

styles of learning of Indian children. The style of learning of most Indian children was more visual rather than verbal, which appeared to be reflected in several different performances: relative superiority on tests of visual abilities, skill in interpreting photographs, proficiency in spelling, proficiency in completing culturally developed visual art forms and learning by imitation.

Learning through language was also seen as part of Indian learning styles. Generally, oral language was used to transmit the folk history, legends and traditions of Indian people, as there was no written language. Some Indian groups placed a different value on speech; the maxim observed was that "silence is golden." The oral tradition has continued to be maintained by most Indian people. An implication for educational practice was that story telling by elders may be a useful teaching method.

In some Indian groups the acquisition of competence was a prerequisite for task performance. There had to be certainty of success before the task was undertaken. Generally an extended period of observation and imitation preceded task action.

The pattern of socialization was indirect. Compliance to expected behaviour was obtained through teasing rather than through use of direct reprimand and confrontation. A tendency to refer discipline to outside authorities such as mythical beings was also observed.

Cazden and John observed that several reports discussed a conflict of values between the home and school.

In a comparative study of mechanical aptitude with Indian boys from several communities at different levels of acculturation in western Canada, Bowd (1973) found a diversity in the patterning of abilities which appeared to be a function of cultural environment. Among the Indian groups tested, spatial mechanical skills appeared to be high, while at the same time there was a widespread English linguistic deficit. The cognitive strengths of these Indian students appeared to be a function of their cultural environment.

Bowd (1974) reviewed the research on the practical mechanical and visual abilities of North American Indians and Inuit. He noted that these cultural groups were generally found to have such abilities. Bowd (1974, 1978) noted that native groups are culturally diverse and stressed that research on native groups must note this cultural heterogeneity. Bowd noted that a holistic method of research would be the preferable method.

Brooks (1975) explored concept learning in Stoney Indian and non-native eight-year-old children from Alberta. Stoney Indian children were superior in memory skills and in measures of independence. Evidence was presented which appeared to show that each group had different cognitive abilities. Memory played a greater role in problem solving for the Stoney group than for the non-native group. An implication for education drawn from this research was that greater use of memory and of spatially presented tasks should be made in teaching Stoney Indian children.

Bland (1970) studied Alaskan native and non-native students to determine if Alaskan native students approached the classroom with a different pattern of learning process than those of other students. Bland found that there was an apparent significant difference between native students and those from the dominant society. The native students possessed a greater ability to demonstrate visual acuity and retention than did other groups of students.

In a study of Saskatchewan Indian and non-native students, Morrow and Randhawa (1981) found that differences in attitudinal and environmental factors rather than differences in cognitive factors between Indian and non-native children accounted for the learning difficulties experienced by Indian children. The personal attitudes and values of Indian students were so different from those emphasized in the classroom that Indian students could not adjust successfully. This inability to adjust to work within the value system reflected in the classroom was seen as the reason Indian children experienced learning difficulties. The cognitive factors of achievement scores in the Canadian Test of Basic Skills subtests of Vocabulary, Reading, Language Skills, and Mathematics were not seen as determining factors as teachers had successfully adapted their teaching methods to assist Indian students in developing these skills. Morrow and Randhawa suggested that teachers adjust their teaching methods to accommodate Indian values rather than expect Indian students to conform to the teacher's values.

The verity of the anecdotal reports appears to have been partially confirmed by the research reports cited. Highly developed visual and memory skills were cited several times. Cazden and John noted the importance of the oral tradition and respect for elders and tradition. The socialization pattern was confirmed by Cazden and John. No research reports were found to verify the attributes of cooperation and sharing. Cazden and John supported the theme of certainty of success before task undertaking.

There were several suggestions of conflict between the teaching style of the school and the learning style of the student. Schools tended to rely heavily on verbal presentations in English while Indian students were visually oriented.

An important aspect noted was the ability to generalize findings. As Indian groups are culturally diverse, research findings for one group are not necessarily applicable to all Indians or to other Indian groups.

Successful Methods for Teaching Indian Children from Some Cultural Groups

The purpose of this subsection is to demonstrate that there are preferred methods for teaching Indian children from some cultural groups; that is, methods of teaching which match the student's preferred learning style with the teacher's teaching style. Three references are cited.

Kleinfeld (1971, 1974) described instructional strategies for new teachers entering Alaskan cross-cultural community classrooms. These strategies were based on questionnaire data from

teachers in small village schools operated by the State of Alaska and the Bureau of Indian Affairs.

Successful instructional strategies were described in seven areas.

The first effective instructional strategy noted by Kleinfeld was the development of a personal relationship with the students. This personal relationship led to an informal classroom situation where reticent students became comfortable enough to speak in the classroom. The development of personal relationships appeared to be more critical for teaching native students successfully than for teaching non-native students. Native students from small villages were accustomed to primary group intimate relationships rather than the secondary group limited relationships of cities. Developing trust in the teacher was defined as a gradual process. Rapport and trust were developed by avoiding formal teaching situations and by having close physical proximity. The instant superficial personal relationships characteristic of urban groups was to be avoided. Children would talk in small informal groups rather than in front of the class. Friendship ties were to be taken into account when forming small groups in order to prevent interference from unfriendly social relationships. Learning the native language was found to be an effective means of obtaining student co-operation.

The second effective strategy noted by Kleinfeld centred on competitiveness. Traditional values are changing so that competitiveness rather than cooperation is becoming more dominant.

Students from acculturated villages showed stronger competitive traits than students from isolated villages. However, such competitiveness may be culturally masked and may be overlooked by the teacher. Students may refuse to participate from fear of failure or from resistance to offensive teaching methods rather than because of non-competitiveness. Students believed they lost less face by not answering questions than by answering incorrectly.

Boasting about winning rather than the winning itself was disapproved. Students did not vocalize their success.

Student refusal to participate may be passive resistance to a teacher who is not trusted. In such a situation, a change of teaching methods was recommended. Individualized instruction, where the student competes against himself rather than other students, was effective in many cases. Furthermore, the setting of realistic individual goals reduced fear of failure.

Kleinfeld noted that the third effective instructional strategy was joking. Joking as a means of social control was found to be particularly effective. Joking is used in native culture as an indirect method of communicating information that might otherwise cause embarrassment or loss of face. Joking must, however, work in both ways. The teacher must accept joking when he is guilty of violating community rules. Humour has been found to be important in resolving the conflicts that arise in the classroom. Joking may be used as an indirect means of communication in a diversity of delicate social relationships. Friendship overtures can be rejected without fear of loss of face. Students can be praised indirectly.

The joking situation, being by definition not serious, thus served as an effective teaching strategy.

Teaching that used the traditional project-reward-work rhythm was the fourth successful instructional strategy described by Kleinfeld. The traditional rhythm of work in native communities was a period of hard work followed by a period of feasting and rest. Adapting classroom tasks to this rhythm with specific learning tasks with clearly defined goals, which demanded intensive work, was found to be more effective than a monotonously steady work routine.

The fifth effective strategy noted by Kleinfeld was based on the observation that native students have a more observational, rather than question and answer, learning style. Native children are accustomed to learning by observation, by watching adult activities and waiting for the total situation to inform them of the meaning of the actions. In such situations, questions are unnecessary. This reliance on observation may have allowed native students to develop cognitive strengths in image memory. Instructional strategies that made use of movies, charts and diagrams were found to be particularly effective. Such methods avoided complete reliance on English language competence. Image-based instruction provided a means to present experiences unavailable in remote villages and was highly effective in building English language competence.

Relating new academic material to the student's background experience in the village was the sixth effective strategy noted by Kleinfeld. Not only was this an effective motivational device, but

the integration of unfamiliar material into the student's existing conceptual structure by becoming attached to some previous experience or concept provided an anchoring idea for the student. Communication was facilitated by this technique.

Parental encouragement and involvement were described as a central cause of motivation to do well in school and was the last effective strategy noted by Kleinfeld. Teacher visits to student homes to explain school policies to parents was found to be particularly effective in increasing student motivation.

Slentz and Leith (1976) identified the most effective teaching strategies for science instruction in northern Manitoba schools. These strategies recognized the culture and the environment in which the instruction took place. The rationale for the study was that teaching methods must recognize the culture and the environment in which the instruction takes place. Slentz and Leith thought that there were several strategies that are particularly effective with Indian children. Sixteen student teachers were selected to teach for a five-week period in northern Manitoba schools. The sample consisted of four hundred children from twenty-five classrooms in eight schools. Prior to teaching, each student teacher reviewed and practised six distinct teaching strategies. These six strategies were organized under four categories which are described in the following paragraphs.

A. The rational approach--the teacher directs the students through questioning to a generalization by the use of reason.

A - 1 Demonstration Questioning

A - 2 Values Discussion

B. The guided discovery approach--the teacher guides the students to take an active part in discovering relationships among observed phenomena.

B - 1 Activity Centres

B - 2 Activity Sessions

C. The experimental approach--with the assistance of the teachers, the students experience the scientific method.

C - 1 Group Problem Solving

D. The information-centred assignment--the student is assigned to work independently and search out information about a topic.

D - 1 Individual Assignments

Attitude scales were used to measure the student's attituces to teaching strategies. Achievement was determined by teacher constructed tests.

Slentz and Leith found that for all grades, four to eleven, the most frequently used strategy--Demonstration - Questioning--was least liked by Indian children but that student achievement as a result of this strategy was high. The most liked teaching strategies were Activity Sessions and Group Problem Solving by elementary students and Individual Assignments Values Discussion by secondary students. The most successful teaching strategies, in terms of achievement, used with elementary children were Group Problem Solving and Activity Sessions, whereas the most successful

strategies for the secondary group were Individual Assignment and Demonstration-Questioning. Values Discussion was the least successful strategy.

The Ontario Ministry of Education (1977: 21) suggested that teachers of native children adapt their teaching methods to match the student learning styles. Specifically, seven areas of adaptation were mentioned. These are described in the following paragraphs.

Ontario native students generally spoke languages which were rooted in an oral rather than a written tradition. To develop competence in English or French, most students required additional practise in vocabulary development and reading comprehension.

Non-verbal communication was important. Students followed a learning pattern which required a great deal of time spent in observation. Performance was attempted once certainty of ability was assured. Premature bungling attempts were met with teasing, successful performance was met with quiet acceptance.

Native students tended to prefer self-motivated projects and learning activities which could be completed with minimal interaction between student and teacher.

Within the classroom settings, students wanted and usually handled independence and responsibility.

Because of a cultural tendency towards lack of competition and leader-orientation, emphasis should be placed on small group and individual projects.

The last area of adaptation mentioned by the Ontario Ministry of Education was the difference in cultural values with regard to competitive awards. Methods which positively reinforced student self-perception would be more successful than competitive awards.

Although these reports addressed differing aspects of teaching, they appeared to complement each other. Techniques that relied heavily on questioning were not preferred by Indian students; there was instead a preference for activity sessions and individual projects. Students preferred to learn independently albeit with a preference for close teacher-student interaction. (They preferred the informality of activity sessions and the individual teacher contact of individual assignments rather than the formality of Demonstration-Questioning). Teaching styles could be adapted to match the student's preferred learning style.

Experiments With Methods of Presentation

The literature consulted in this study appears to indicate generally that Indian students from various cultural groups would have greater academic achievement if visual methods of instruction were used in preference to other methods of presentation. The purpose of this section is to review this literature and suggest that this simplistic approach does not adequately address Indian student needs. Two references are cited.

Shears (1970) compared visual and auditory methods of teaching word recognition to American Indian children living on a closed reservation in Minnesota. Twelve students were taught basal reader words and familiar words for forty minutes using an auditory method and a visual method. No significant difference in word recognition was found between visual and auditory methods of presentation.

McCartin and Schill (1974, 1977) reported on an experiment with three mods of instruction for teaching elementary grade Tahclah Indian school children from Washington. The three modes of instruction were text (reading) presentations, oral presentations and visual presentations. One hundred and four grades three through eight students were taught a unit on the nature of cities in three class periods of thirty minutes each. As a result of the literature review for their study, McCartin and Schill expected that students taught by visual methods would perform better than students taught either by oral presentations or by text presentations. However, they found no significant difference in student achievement regardless of mode of presentation used. There was instead a tendency towards higher student achievement when the oral mode of presentation was used.

Although limited in scope, the two references cited appear to indicate that instructional requirements of Indian students from some cultural groups are not necessarily met by the simplistic approach of adopting visual methods of instruction.

Learning Style

This section deals with some models of defining learning style, research based on the Learning Style Inventory and educational implications of using learning style.

Models for Defining Learning Style

This subsection describes some models for measuring learning style and with the development of Learning Style Inventory.

Some Measures of Learning Style

Gephart (1980) described four models for identifying student learning style: Kolb, Gregorc, Dunn and Dunn, and McCarthy.

Kolb (Gephart, 1980) identified perception and processing as two dimensions of learning. Perception was seen as a continuum from concrete to abstract while processing was seen as a continuum from reflective to active. Kolb thus defined four learning styles: Type One learners are concrete and reflective, Type Two learners are abstract and reflective, Type Three learners are abstract and active, while Type Four learners are concrete and active.

Gregorc (Gephart, 1980) crossed the abstract/concrete dimension with the random/sequential dimension to define four learning styles. These styles are termed Concrete Sequential, Concrete Random, Abstract Sequential, and Abstract Random. Gregorc found that most people show a definite preference for any one or two of these modes.

Dunn and Dunn (Gephart, 1980) devised the Learning Style Inventory to measure learner preferences for eighteen elements of learning style (listed in Chapter III). These elements were derived from four areas that affected student learning. These four areas are: immediate environment, sociological preferences, own emotionality and physical needs.

McCarthy (Gephart, 1980) devised a model of learning style based on left and right brain hemisphere processing differences. McCarthy's model combined four major learning styles with left and right brain hemisphere processing techniques.

Keefe (1979 b) briefly described thirty-two student learning styles currently used to describe student learning. These styles were grouped in three areas: Cognitive Styles, Affective Styles, and Physiological Styles. Some measures of learning style had greater application for the improvement of student learning than others.

Keefe (1979 b) differentiated between learning style and cognitive style and between cognitive style and cognitive ability. Cognitive ability refers to intellectual ability or content such as general intelligence or mental ability. Cognitive style refers to the process of knowing; it describes how information is processed and is concerned with manner or preference of performance. Learning style is a broader term than cognitive style and includes cognitive style as well as affective and physiological styles.

Development of the Learning Style Inventory

The Learning Style Inventory was developed by Rita Dunn, Kenneth Dunn and Gary Price (Dunn and Dunn, 1978). Initially, Rita Dunn was asked to develop individualized programmed learning techniques for educationally disadvantaged students. She observed that while some selected methods were extremely successful with some students, they were not equally effective with all students. She concluded that different methods of instruction were required for different students and found that, regardless of curriculum, specific methods were attractive to certain students. Thus stimulated, research of the literature on student learning lead Dunn and Dunn to conclude that there were at least eighteen categories which affected a student's learning characteristics. In order to identify student learning preferences, Dunn and Dunn devised the Learning Style Questionnaire in 1968-69, which questionnaire was continually tested and revised over the next five years. Gary Price became interested in the instrument in 1974 and conducted a content analysis of the questionnaire items. As a result of this content analysis, the Learning Style Inventory (1975 Edition) was developed. The Learning Style Inventory was further revised in 1978.

Research With the Learning Style Inventory

The purpose of this subsection is to describe some research, which can be related to this study, that has been conducted with the Learning Style Inventory.

Comparison of Learning Styles for Male and Female Students

Dunn and Dunn (1978) and Price, Dunn and Dunn (1977) compared learning styles for male and female students across grades and within grades. No research findings were available which compared learning styles for males and females in general.

The differences in learning styles for male students across grades were described. Lower grade level male students preferred a quieter environment, were more teacher-motivated, preferred learning with adults more, preferred learning more through tactile and kinesthetic modalities, and preferred learning in the late morning more than did upper grade level male students.

The differences in learning styles for female students across grades were described. Lower grade level female students were less persistent, preferred learning with adults more, preferred learning more through tactile and kinesthetic modalities and less through auditory methods, required more intake, and preferred learning in the late morning less than did upper grade level female students.

Comparisons of learning styles for male and female students within grades as reported by Dunn and Dunn (1978) could not be directly related to this study. Thus these comparisons are not described. However, there were significant differences in learning styles between male and female students.

Comparison of Learning Styles Across Grades

Dunn, Dunn and Price (1981) compared changes in learning styles for students across grades three through twelve. They found statistically significant changes in learning style for students at various grade levels.

The changes are significant at the 0.0001 level of significance. The changes described are:

1. More sound was preferred as grade increased;
2. More light was preferred as grade increased;
3. More warmth was preferred in grades 3, 4, 5, 8 and 9 than in grades 6 and 7;
4. Less formal design was preferred as grade increased;
5. Grades 7 and 8 were less self-motivated than other students;
6. Less students were teacher-motivated as grade increased;
7. Students became less motivated as grade increased;
8. Students were most persistent in grade 6 and least persistent in grades 9, 10 and 11;
9. Less structure was preferred as grade increased;
10. Learning alone generally increased as grade increased; however, grade 3 students expressed the lowest need to work alone.
11. Learning with peers was most highly preferred by students in grades 6 and 8 and least in grade 11;
12. Learning with adults was less preferred as grade increased;

13. Learning in several ways decreased as grade increased;
14. Learning auditorially increased as grade increased;
15. Visual preferences decreased as grade increased;
16. Learning tactually decreased as grade increased;
17. Learning kinesthetically decreased as grade increased up to grade 8, followed by a gradual increase as grade increased;
18. More intake was preferred as grade increased;
19. No trend was observed in late morning preferences.

Learning Style and Self-Concept

Dunn, Dunn and Price (1981) (also Dunn, Price, Dunn and Saunders, 1979) compared the relationship between a student's self-concept and his preferred learning style. Individuals with a high self-concept preferred quiet, liked to learn in a warm temperature, preferred to learn in several ways, did not have auditory preferences, and did not require mobility. Individuals with a low self-concept preferred a cool environment, preferred sound, were neither adult nor teacher-motivated, had low persistence, preferred not to learn in several ways, had auditory preferences, and required mobility. The greatest differences between the two groups were in the areas of persistence, teacher-motivation and mobility. Low self-concept individuals required increased mobility, sound, and the presence of adults during learning while high self-concept individuals were persistent, able to remain in one location, and liked to learn in several ways.

Learning Style and Academic Achievement

Dunn, Dunn and Price (1981) compared the relationship of academic achievement in mathematics and reading with learning style variables. They found that students who had high reading achievement were persistent, were responsible, were self-motivated, did not function best in late morning, preferred formal design, and did not prefer bright light. Students who had high mathematics achievement were persistent, were responsible, did not function best in late morning, worked independently of adults, and preferred formal design. Students whose reading achievement was low were adult-motivated, were tactile and kinesthetic, functioned best in late morning, required intake, and preferred informal design and bright light. Students whose mathematics achievement was low were adult-motivated, were peer-oriented, functioned best in late morning, required intake, required informal design, were less persistent, and were less responsible. Requiring formal design, being persistent, being responsible, and functioning best in late morning were the learning style variables which most discriminated between students who had high and low reading and mathematics achievement.

Dunn, Dunn and Price (1981) suggested that general classroom instructional strategies tended to match the learning style characteristics of high achieving students, which may be one of the reasons for their high achievement. Alternatively, the achievement levels of low achieving students may be raised by modifying

instructional strategies to match their learning style characteristics.

Dunn (1982 c) summarized seven research reports which investigated the learning style characteristics of gifted/talented students. The findings consistently provided evidence which indicated that gifted/talented students have unique learning style characteristics. Learning style characteristics of gifted/talented students were found to be independence, self-motivation, persistence, and strong perceptual strengths.

Marcus (1979) and Dunn, Dunn and Price (1981) compared the learning style characteristics of below-average, average, and above-average students. There were significant differences among the three ability groups. In comparison with the other two ability groups, below-average students were less teacher-motivated, were more unmotivated, were less self-motivated, were less persistent and responsible, were in need of more structure, were least peer oriented, required more mobility, were less auditory and visual, and more tactile and kinesthetic than were average and above-average students. Highly significant characteristics of above-average students were high teacher-motivation, most persistent, most responsible, least in need of structure, most preference of learning alone, and more auditory.

Marcus (1979) concluded that below-average students were the most disadvantaged in a traditional classroom because these were generally the students who were least able to learn through their preferred learning styles. He noted, however, that no areas of

learning style were characteristic of all the students within any ability group. He emphasized that each student be treated as an individual and be taught through his preferred learning style.

Related Research

Dunn, Dunn and Price (1981: 37) indicated that the Learning Style Inventory was administered to North American Indian students. No statistics, however, which related directly to learning style characteristics of the Indian students in that study were available. There was no indication of the administration of the Learning Style Inventory to Cree-speaking students.

Educational Implications

This subsection deals with matching learning style with teaching style. Results of matching learning style with teaching style, methods for matching learning and teaching styles, and suggestions for adapting teaching techniques to match learning style characteristics are discussed.

Results of Matching Learning Style with Teaching Style

The purpose of this part is to suggest that improved academic achievement generally results when teaching styles are adapted to accommodate student learning styles. Four references are cited.

Dunn (1982 b) listed ten research reports which studied the effects of matching teaching styles with learning styles. The

effects on students at all grade levels were investigated. These studies verified that statistically significant improvement in student academic achievement resulted when students were taught through their unique styles of learning.

Gephart (1980: 1) concluded, "To match teaching style with learning style seems so obviously beneficial..." in his review of matching learning style with teaching style.

Anderson and Bruce (1974: 88) stated, "Matching students with selected learning environments is an efficacious means of increasing student achievement..." in their report on implementing an instructional method for accommodating student learning styles.

Dunn and Dunn (1979 a) described some outcomes that result when students learn in ways that are natural to them. These outcomes were: increased academic achievement, improved self-esteem, a liking for learning, improved basic skills, stimulated creativity and gradually increasing learner independence.

Generally, improved student academic achievement is one of the benefits which can be expected to occur when students are allowed to learn through their preferred learning modality.

Methods for Matching Teaching and Learning Styles

The purpose of this part is to show that there are methods for adapting teaching styles to match student learning styles. Seven references are cited.

Bennett (1979) discussed the importance to teachers of understanding a student's cultural orientation. Two common

components of cultural orientation which teachers could readily identify were a student's preferred mode of orientation and a student's preferred mode of participation. Teachers could then adjust their teaching styles to accommodate their students' preferred modes of orientation and participation. Students would probably not be academically successful if they were required to make too great an adjustment, within the classroom, from their preferred mode of orientation and participation.

Dunn and Dunn (1979 b) suggested that teachers adapt their teaching styles to accommodate their students' learning styles. This was preferable to assigning students to specific teachers in order to match teaching and learning styles. Teacher adaptation was essential for several reasons. Firstly, learning style and teaching style characteristics are too diverse to be readily clustered into "... such neat little packages." Secondly, teaching styles and learning styles are not consistently maintained. Thirdly, teacher effectiveness is not necessarily a factor of specific teaching style characteristics; possession of certain teaching style characteristics is not necessarily indicative of an effective teacher. Lastly, Dunn and Dunn's experience has demonstrated that most teachers can, with training, adjust their instructional strategies to accommodate all the students in the classroom.

Ellis (1979) described the difficulties which are encountered when schools attempt to place students with teachers so that student learning styles match teacher teaching styles. The wide variety of models of teaching style and learning style make

this an impossible task. The solution, Ellis suggested, was to have teachers learn a variety of teaching styles which could then be used as required in the classroom. Teachers can learn to adapt their learning style to accommodate the learning styles of their students.

Turner (1979) recognized that the durability and strength of a school lay in the wide variety of teaching styles to which students were exposed. The value of student exposure to a variety of teaching styles was that students would learn to adapt to and to accommodate differences in people with whom they work. Successful teachers were those with flexible instructional styles and strategies.

Similarly, Gephart (1980) viewed periodic mismatches as beneficial as such mismatches could result in new learned behaviours and styles, added variety, were often challenging, and were indicative of the varied demands of a person's environment. Lengthy mismatches, however, could be harmful.

Dunn and Dunn (1975, 1978) have demonstrated methods for reorganizing classrooms and designing instructional methods and materials which indicated that individual teachers could restructure their instructional strategies such that the learning styles of all students could be accommodated within the classroom, without changes in school structure, and at little cost.

Thus, there does not appear to be need for either a "computer dating" approach or great costs to be involved in matching learning styles with teaching styles. The learning styles of all students can be accommodated within the classroom by a change in

some of the instructional strategies used by a teacher.

Suggestions for Adapting Teaching Techniques

Dunn, Dunn and Price (1981: 4-12) have described methods for adapting the teaching environment so that all student learning styles identified with the Learning Style Inventory can be accommodated. These methods are quoted in full in Appendix E.

Summary

The conclusions and findings reached from this literature review are described:

1. Cognitive and perceptive styles vary greatly among different cultural groups. Differences appear to be found in the content rather than in the processes involved in cognition and perception. These differences in style appear to result from the individual's interaction with his culture and environment.
2. Indian children of any Indian culture appear to have a learning style that is unique to their specific culture. The learning style of Indian children from various cultural groups has been described as visually oriented.
3. No specific description of the learning style of the student population in this study was found.
4. Conflict between school teaching style and student learning style was noted in several studies.
5. As Indian groups are culturally diverse, research findings

on one Indian group are not necessarily generalizable to other Indian groups.

6. Teaching methods could be successfully adapted to match Indian student learning styles. These adaptations, however, involved a great deal more change than the simplistic adoption of the use of visually presented materials as the sole instructional strategy.

7. There are a large variety of models for describing learning style and a wide variety of methods for identifying learning style. The Learning Style Inventory is only one of several techniques which can be used.

8. Some research findings on learning style characteristics are:

   A. There are differences in learning style characteristics between male and female students;

   B. There are differences in learning style characteristics among students at various grade levels;

   C. There are differences in learning style characteristics below low and high self-concept students;

   D. There are differences in learning style characteristics among below-average, average, and above-average academic achievement students; and

   E. Gifted/talented students have specific learning style characteristics.

9. Although there were learning style trends among specific groups of students, no learning style characteristic described all

students within any group. There was a large variation within groups.

10. No research statistics were found on Learning Style Inventory administration to Cree-speaking students.

11. Matching teachers teaching styles with student learning styles generally resulted in increased student academic achievement. Other benefits were found.

12. Teachers can adapt their teaching strategies to accommodate the learning styles of all students within the classroom.

13. Specific suggestions for adapting instructional strategies are provided.

CHAPTER III

RESEARCH PROCEDURES

Statement of Problem

This study identifies, through the use of the Learning Style Inventory, variables of learning style that are existent among grades four through ten students attending school in isolated communities of Northeastern Manitoba.

Questions Addressed by the Study

This study addressed the following questions:

1. Which variables of learning style were sufficiently prevalent to be important for educational practise for the study population?
2. Were there any learning style differences among the three schools in the study sample?
3. Were there any learning style differences between male and female students?
4. Were there learning style differences among elementary grade students, junior high students, and senior high students?
5. Were there learning style differences among students whose academic achievement was excellent, students whose

academic achievement was average, and students whose academic achievement was below-average?

6. Were there learning style differences among students whose school attendance was high, students whose school attendance was medium, and students whose school attendance was low?

Instrument Description

Learning Style Inventory

The Learning Style Inventory (LSI), 1978 edition, (see Appendix B) by Dr. Rita Dunn, Dr. Kenneth Dunn and Dr. Gary Price was used to obtain the information on learning styles. The LSI was developed through content and factor analysis. It is a comprehensive approach to how students prefer to function, learn, concentrate, and perform during educational activities in the following areas: (a) immediate environment (sound, temperature, light, and design); (b) emotionality (motivation, responsibility, persistence, and the need for either structure or flexibility); (c) sociological needs (self-oriented, peer-oriented, adult-oriented, and/or combined ways); and (d) physical needs (perceptual preference(s), time of day, food intake and mobility) (Dunn, Dunn and Price, 1981). The Learning Style Inventory, 1978 edition, contains 104 questions which concern each of the learning style areas presented. The student's responses to these questions tend to reveal highly personalized preferences that, when identified

as relevant factors and combined, represent the way in which a student prefers to study. The 24 areas include the following (Dunn, Dunn and Price, 1977: 3):

1. Sound - quiet or sound preferred;
2. Light - bright or low;
3. Temperature - warm or cool;
4. Design - formal or informal
5. Self-motivated;
6. Adult-motivated;
7. Teacher-motivated;
8. Persistence - high or low;
9. Responsibility - high or low;
10. Structure - needs or does not need structure;
11. Prefers learning alone;
12. Peer-oriented learner;
13. Learning with adults;
14. Prefers learning through several ways;
15. Has auditory preferences;
16. Has visual preferences;
17. Has tactile preferences;
18. Has kinesthetic preferences;
19. Food - requires or does not require food;
20. Functions best in morning;
21. Functions best in late morning;
22. Functions best in afternoon;
23. Functions best in evening;
24. Mobility - needs or does not need mobility.

Answer sheets are provided with the tests. A simplified true-false answer sheet (see Appendix B) is designed for use by grades three, four and five students, while the Standard Answer Sheet (see Appendix B) is intended for use by grades six to twelve students.

The Learning Style Inventory can be completed by students in approximately thirty minutes.

Scoring Options

The Learning Style Inventory may be scored using the LSI computer program, for which three options are available (Dunn, Dunn and Price, 1981). The options are:

(a) the individual student learning style profile which includes personal identification data such as name, age, sex, teacher's name, school name; consistency score; raw score; standard score; LSI area headings; and a graph of the relative location of the student's standard score in each area;

(b) the LSI Area Summary, a two-page print-out, which indicates the number of students in the group and the percentage of students in the group with standard scores of 60 or higher or 40 or lower for each LSI area. The first page summarizes the areas for all students in the group who have standard scores of 60 or higher for each area, while the second page summarizes the areas for all students in the group who had standard scores of 40 or lower; and

(c) the LSI Group Summary, a two-page print-out, which identifies individuals having similar learning preferences. The

first page identifies students with standard scores of 60 or higher while the second page identifies students with standard scores of 40 or lower.

Options (b) and (c) are available only in addition to option (a). Examples of the three options are shown in Appendix C.

Consistency Score

A consistency score is calculated to determine how carefully each student responded to the questions. Ten questions are repeated throughout the inventory. A percentage is calculated for each student based on the number of pairs of questions answered in the same way (Dunn, Dunn, and Price, 1975).

Interpretation of the LSI Student Learning Profile

The standard score scale ranges from 20 to 80 with a mean of 50 and a standard deviation of 10. The standard score is an expression of the student's raw score for each LSI area as a factor of the total possible raw score for that area. Students who have a standard score of 60 or higher in any LSI area have a strong preference for that area while they study, while students who have a standard score of 40 or lower in any LSI area have a strong preference not to work in that area while they study. A standard score between 40 and 60 indicates neither a strong preference to work in that area nor a strong preference not to work in that area during any learning activity.

Reliability and Validity of the LSI

Price, Dunn and Dunn (1977) and Dunn, Dunn and Price (1981) reported that reliability and validity have been established for the LSI.

Description of Population

The population in this study included all Cree-speaking students enrolled in grades four through ten in seven schools in Northeastern Manitoba. The schools are operated by the Federal Department of Indian and Northern Affairs in isolated communities in Northeastern Manitoba.

The number of students in the study population is shown in Table 1 (Department of Indian Affairs, 1983).

TABLE 1

Number of Students in Study Population
1979-80

Grade	Total Number of Students
4	187
5	218
6	188
7	177
8	126
9	121
10	94
Total:	1,111

The number of students in the study population was 1,111.

Almost without exception all the students in the study population spoke English as a second language and had limited contact outside their particular community. To a large extent, the communities remain isolated and are inaccessible, except by air, throughout most of the year. Television and telephone services were introduced only in 1976 and 1978 in the communities considered in this study.

The school plants in most of the communities in this study were new buildings with good facilities. Until recently (1977-78) most teachers were non-Indian and did not speak any Indian language. The language of instruction was usually English. Until recnetly, there had been only a very limited effort to adopt a culturally relevant curriculum; the Manitoba Department of Education curriculum guides and recommended textbooks were used. The student drop-out rate was high. Average 1979-80 school attendance varied from a low of 55 percent at School D to a high of 92 percent at School E (Department of Indian Affairs, 1983).

Description of Sample

The study sample included all Cree-speaking students enrolled in grades four through ten in three schools who were in attendance at school during test administration.

The three schools in the study sample were selected by lot.

The number of students enrolled by grade in the three study

sample schools is shown in Table 2 (Department of Indian Affairs, 1983).

TABLE 2

Number of Students Enrolled by Grade in the Three Study Sample Schools, 1979-80

	Schools		
Grade	School A	School B	School C
4	46	25	39
5	75	26	37
6	39	26	51
7	45	36	41
8	17	19	24
9	19	18	22
10	12	10	33
Total:	253	160	247

Total number of students in the study sample was 660.

Administration of the LSI

Approval for administering the Learning Style Inventory in the study sample schools was obtained from the Department of Indian Affairs (see Appendix A). The principals of the schools involved were contacted and were told of the purpose of the study. This writer visited each of the schools involved and discussed test and administration procedures with the grades four through ten teachers. The LSI was administered by the classroom teachers in April, 1980.

To overcome possible difficulties with the use of the answer sheets, students were instructed on their use and practised on an answer sheet copy prior to test administration. Grades 4, 5 and 6 students used the true-false answer sheet while grades 7, 8, 9 and 10 students used the Standard Answer Sheet. Students were instructed to give immediate responses to each item. Students were instructed not to discuss items among themselves; however, they received teacher assistance when comprehension difficulties were experienced. Although thirty minutes was the expected completion time, no time limit was placed on test completion except that the test had to be completed in one sitting. Upon completion, the tests were forwarded to the writer for analysis.

Data Collected

The data collected for each student in the study were:

1. Names of student, teacher, and school;
2. Cree-speaking or non-Cree speaking;
3. Sex, where sex was listed as male or female;
4. Grade, where grade was listed as 4, 5, 6, 7, 8, 9, or 10;
5. School attendance, listed as a percentage and based on the student's cumulative attendance, as listed in the student cumulative file, since the student began school;
6. School academic achievement, described by the student's

homeroom teacher as excellent, average, or below-average and

7. Answer sheet to the LSI.

Treatment of Data

The student Learning Style Inventory answer sheets were forwarded to Price Systems Inc., Lawrence, Kansas, in December, 1981, where computer analysis provided individual student learning style profiles, LSI Area Summaries for each of the thirty classroom groups, and LSI Group Summaries for each of the thirty classroom groups.

Individual student learning style profiles with a consistency score less than 70 were excluded from further study as were individual student learning style profiles for all non-Cree speaking students. No attempt was made to retest students whose consistency score was less than seventy percent.

Data from the LSI Group Summaries were considered for this study. The LSI Group Summaries were two-page print-outs; the first page summarized the learning style variables for which students exhibited a high degree of preference while they studied; that is, those areas in which students had standard scores of 60 or higher. The second page summarized the learning style variables for which students exhibited a low degree of preference while they studied; that is, those areas in which students had standard scores of 40 or lower. Results in any area of the student learning style profile

where students had standard scores between 41 and 59 were not considered for further study as this indicated that the students had a high preference neither for or against this area in their learning style profiles.

Frequency tables listing the number of students who had standard scores of 60 or higher and 40 or lower as a function of each of 24 learning style areas were made with regard to:

1. Total number of student preferences for each learning style variable;
2. Total number of student preferences for each learning style variable as a function of each school, School A, School B, and School C;
3. Total number of student preferences for each learning style variable as a function of student sex, either male or female;
4. Total number of student preferences for each learning style variable as a function of school grade categories--elementary, junior high, and senior high--where students in grades 4, 5, and 6 were in the elementary category, students in grades 7 and 8 were in the junior high category, and students in grades 9 and 10 were in the senior high category;
5. Total number of student preferences for each learning style variable as a function of each academic achievement category--excellent, average, and below average, where teachers defined the academic achievement categories as

terms relative to each other and based on the student's general academic achievement; and

6. Total number of student preferences for each learning style variable as a function of school attendance categories--high, medium, and low--where students with cumulative percentage attendance 80 or higher were placed in the high attendance category, students with cumulative percentage attendance lower than 80 but not lower than 60 were placed in the medium attendance category, and students with cumulative percentage attendance lower than 60 were placed in the low attendance category.

These frequency tables are presented in Appendix D.

Student preference for each learning style variable was then expressed as a percentage, where the percentage of student preference for a learning style variable was the total number of student responses per category for a variable expressed as a function of the total number of students in that category. Tables presenting the percentage preference for each learning style variable per category were constructed and are presented in Chapter IV.

The information presented in the tables which listed percentage of student preference for a variable of learning style was then analyzed. Educationally important learning style variables and significant differences were noted and discussed in response to the six questions described for this study.

The information presented in these tables was further analyzed by placing the learning style variables with significant differences, in rank order for each category mentioned. Only the 12 variables which had the highest percentage preference were considered for Questions 2, 3, 4, 5 and 6, while all the learning style variables which were sufficiently prevalent to be important for educational practise were listed for Question 1. Tables presenting these variables were constructed and are presented in Chapter IV.

Test for Being Important for Educational Practise

For purposes of this study, variables of learning style are said to be sufficiently prevalent for educational practise for all students in the study population if there was a minimum of 25 percent response for that variable.

Test for Significance

For purposes of this study, results are said to be significant where there was a percentage difference of 3 or greater for any learning style variable in any category from the total student percentage preference for that learning style variable.

No statistical tests for significance were performed.

Summary

This chapter included the statement of problem and the questions addressed by the study. The Learning Style Inventory, the study population and study sample were described. The study design, procedures of the investigation, including preliminary arrangements and collection of data, were described.

CHAPTER IV

DATA AND ANALYSIS OF DATA

Data with regard to the number of students whose learning style variable preferences were considered for further study and with regard to the percentage of student preference for each learning style variable in the various categories are presented and analyzed. A summary is presented.

Number of Students Considered

The number of students to whom the Learning Style Inventory was administered, the number of students whose Learning Style Inventory results were considered for further study, the number of students from each school whose Learning Style Inventory results were considered for further study, the number of male and female students whose Learning Style Inventory results were considered, the number of students in each grade category whose results were considered, the number of students in each academic achievement category whose results were considered, and the number of students in each school attendance category whose results were considered, are presented in this section.

Number of Students Tested

The number of students to whom the Learning Style Inventory was administered is shown in Table 3.

TABLE 3

Number of Students Tested

Grade	Schools		
	School A	School B	School C
4	15	15	32
5	36	20	37
6	36	20	19
7	17	18	27
8	25	15	26
9	10	9	15
10	5	13	12
Total:	144	110	168

The total number of students tested was 422.

Number of Student Results Considered for Further Study

The number of students whose Learning Style Inventory results were considered for further study is presented in Table 4. The Learning Style Inventory results for non-Cree-speaking students and/or students whose consistency score was lower than 70 were

excluded from further study. There were only five non-Cree-speaking students to whom the Learning Style Inventory was administered.

TABLE 4

Number of Students Whose Results Were Considered For Further Study

Grade	School		
	School A	School B	School C
4	8	10	16
5	21	18	22
6	19	14	12
7	10	12	19
8	20	10	20
9	7	9	10
10	4	12	12
Total:	89	85	111

The number of students whose results were considered for further study was 285.

Comparison of Student Numbers Among Schools

The number of students in the study sample as presented in Table 2, the number of students to whom the Learning Style Inventory was administered as presented in Table 3, and the number of students whose results were considered for further study as presented in Table 4, are compared in Table 5.

TABLE 5

Comparison of Student Numbers Among Schools

	School			
	School A	School B	School C	Total
Number of students in sample	253	160	247	660
Number of students tested	144	110	168	422
Number of results for further study	89	85	111	285

The number of students whose Learning Style Inventory results were considered for further study was 67.5 percent of the total number of students to whom the Learning Style Inventory was administered, and 43.2 percent of the total possible number of students in the study sample.

There were significant differences among the three study sample schools in the percentage of students from each school to whom the Learning Style Inventory was presented and whose results were considered for further study. Of the students to whom the Learning Style Inventory was administered, 61.8 percent of the students at School A had results which were considered for further study, 66.1 percent of the students at School C had results which

were considered for further study, and 77.2 percent of the students at School B had results which were considered for further study.

There were also significant differences among the three study sample schools in the percentage of all possible students in the study sample whose results were considered for further study. Of the student population at School A, School B and School C, 35.1 percent, 44.9 percent, and 53.1 percent, respectively, of the students had results which were considered for further study.

However, when the number of students from each school whose results were considered for further study are compared with each other, 31.2 percent of the students are from School A, 29.8 percent of the students are from School B and 38.9 percent of the students are from School C. There is no significant difference between the number of students from School A and School B. School C has a significantly higher percentage of students whose results were considered for further study.

Number of Male and Female Students.

The number of male and female students whose Learning Style Inventory results were considered for further study is presented in Table 6.

TABLE 6

Number of Male and Female Students

School	Sex	
	Male	Female
A	42	47
B	49	36
C	52	59
Total:	143	142

The number of male students whose results were considered is nearly equal to the number of female students whose results were considered.

Number of Students in Each Grade Category

The number of students in each grade category whose results were considered for further study is presented in Table 7.

TABLE 7

Number of Students in Each Grade Category

School	Grade Category		
	Elementary	Junior High	Senior High
A	48	30	11
B	42	22	21
C	50	39	22
Total:	140	91	54

Student numbers at the various grade levels whose results were considered for further study vary significantly with each other. Of the students whose results were considered for further study, 49.1 percent were in the elementary grade category, 31.9 percent were in the junior high grade category, and 19 percent were in the senior high grade category.

Students tended to have a higher consistency score rate as grade category increased; only 64.5 percent of the elementary grade level had results which were considered for further study and 71.1 percent of the students at the junior high level had results which were considered for further study, while 84.4 percent of the students at the senior high level had results which were considered for further study.

Number of Students in Each Achievement Category

The number of students in each academic achievement category whose results were considered for further study is presented in Table 8.

TABLE 8

Number of Students in Each Achievement Category

School	Achievement Category			Total
	Excellent	Average	Below-Average	
A	25	51	13	89
B	30	34	21	85
C	32	55	24	111
Total:	87	140	58	285

Of the total number of students whose results were considered for further study, 30.5 percent were in the excellent academic achievement category, 49.1 percent were in the average academic achievement category, and 20.4 percent were in the below-average academic achievement category.

Number of Students in Each Attendance Category

The number of students in each school attendance category whose results were considered for further study is presented in Table 9.

TABLE 9

Number of Students in Each Attendance Category

School	Attendance Category			Total
	High	Medium	Low	
A	40	36	13	89
B	68	14	3	85
C	70	34	7	111
Total:	178	84	23	285

Of the total number of students whose results were considered for further study, 62.5 percent were in the high school attendance category, 29.5 percent were in the medium school

attendance category, and 8.0 percent were in the low school attendance category.

Learning Style Inventory administration dates coincided with the spring trapping season, at which time a large number of children were absent from school as they had gone spring trapping with their families. This custom is more prevalent at School A and School C than at School B. School A had the lowest 1979-80 school attendance rate of the three schools in the study sample (Department of Indian Affairs, 1983).

Student Preferences for Each Learning Style Variable

Student preferences for each learning style variable were analyzed in response to the six questions presented in Chapter I. The questions centered on six items which are: variables of learning style which are sufficiently prevalent to be important for educational practise; differences in learning style among the study sample schools; differences in learning style between male and female students; differences in learning style among the three grade categories; differences in learning style among the three academic achievement categories; and differences in learning style among the three school attendance categories.

Educationally Important Learning Style Variables

This subsection addresses Question 1--"Are any variables of learning style sufficiently prevalent to be important for educational practise for the study population?"

Results related to this question are presented in Table 10 (page 69) and Appendix D (page 150).

Variables of learning style were defined as being important for educational practise for the study population if a minimum of 25 percent response was shown for a variable.

Eighteen variables of learning style were found to be sufficiently prevalent to be important for educational practise for the study population. These are listed in Table 11 (page 72).

The variables of learning style which are most prevalent were food intake not required which was preferred by 71.2 percent of the students, learning with adults which was preferred by 57.2 percent of the students, and low persistence which was preferred by 51.6 percent of the students.

The variables of high motivation were not, by definition, sufficiently prevalent to be important for educational practise. However, the absence of any response for any variable of motivation which have a standard score of 60 or higher, and the tendency towards variables of motivation which have a standard score of 40 or lower certainly indicated a common area of concern for the education of these students. Students tended to be ambivalent in the variables of motivation.

Although students were not adult-motivated, there was a tendency to prefer not to learn alone, but to prefer learning with adults and peers. There were, however, a large percentage of students who preferred learning alone (18.6), a large number of students who were not peer oriented (15.3), and a large number of

TABLE 10

Percentage of Total Student Response Identified for Each LSI Variable With Standard Score Greater than 60 or Less than 40

LSI Variable Standard Score 60 or Higher	% of Total	LSI Variable Standard Score 40 or Lower	% of Total
1. Sound Preferred	4.9	1. Quiet Preferred	12.6
2. Bright Light	23.5	2. Low Light	10.9
3. Warm Temperature	28.1	3. Cool Temperature	9.5
4. Formal Design	49.8	4. Informal Design	1.1
5. Self-Motivated	-	5. Not Self-Motivated	4.2
6. Adult-Motivated	-	6. Not Adult-Motivated	28.4
7. Teacher-Motivated	-	7. Not Teacher-Motivated	9.5
8. High Persistence	15.8	8. Low Persistence	51.6
9. High Responsibility	15.1	9. Low Responsibility	26.7
10. Needs Structure	40.4	10. Structure Not Preferred	2.5
11. Prefers Learning Alone	18.6	11. Learning Alone Not Preferred	26.3
12. Peer Oriented Learner	33.0	12. Not Peer Oriented	15.8
13. Learning with Adults	57.2	13. Independent of Adults	26.7
14. Learning Several Ways	34.0	14. Several Ways Not Preferred	6.0
15. Auditory Preferences	39.3	15. No Auditory Preferences	7.0
16. Visual Preferences	43.9	16. No Visual Preferences	3.8
17. Tactile Preferences	30.9	17. No Tactile Preferences	9.8
18. Kinesthetic Preferences	-	18. No Kinesthetic Preferences	15.4
19. Intake Required	4.2	19. Intake Not Required	71.2
20. Morning Best	38.2	20. Morning Not Best	11.0
21. Late Morning Best	38.2	21. Late Morning Not Best	35.8
22. Afternoon Best	23.2	22. Afternoon Not Best	23.5
23. Evening Best	6.0	23. Evening Not Best	6.7
24. Mobility Needed	3.2	24. Mobility Not Needed	22.1
Number of Students	285	Number of Students	285

students who preferred to learn independently of adults (26.7). It must be noted that more than twice as many students preferred learning with adults to learning independently of adults and that twice as many students were peer oriented as were not peer oriented.

Other variables of learning style which were important for educational practise were in the areas of persistence and responsibility; 51.6 percent of the students responded in the variables of persistence which had a standard score of 40 or lower while 26.7 percent of the students responded in the variable of responsibility which had a standard score of 40 or lower.

Learning through several ways was sufficiently prevalent to be important for educational practise. There was a high degree of preference for learning through visual presentations (43.9%) and an almost equally high degree of preference for learning through auditory presentations (39.3%). A preference for tactile methods of learning was another variable of learning style which was important for educational practise. Students then tended to prefer learning through several ways which included visual, auditory, and tactile methods of presentation. However, there was no preference for kinesthetic methods expressed; students tended to prefer not to learn through kinesthetic methods.

Other learning style variables which were important for educational practise were the need for formal design in the study environment and the need for study structure; 49.8 percent of the students required formal design while they studied and 40.4 percent

of the students needed structure. The need for formal design and structure was also noted in the tendencies to preferring quiet, to preferring bright light, to having a preference for no kinesthetic methods of presentation, and to not needing mobility.

Other learning style variables which were important for educational practise were the need for warm temperature and the preference for time of day when learning takes place. Although students had expressed a high degree of preference for five times of day in which they liked to learn, there was no definite indication of the best time of day in which most students preferred to learn. Learning best in the morning was preferred by 38.2 percent of the students. A large number of students preferred the late morning, but than an almost equal number of students expressed a preference for not liking the late morning best. A similar preference was expressed for the afternoon. The most preferred times of day for learning appeared to be morning and late morning, although not learning best in the late morning was preferred by 38.2 percent of the students.

The 18 learning style variables which were sufficiently prevalent for educational practise are presented in rank order in Table 11 (page 72).

Summary of Educationally Important Variables

The students in the study population expressed a preference for 18 learning style variables which are important for their education. They preferred structure and formal design. They

TABLE 11

Variables of Learning Style Which are Important for Educational Practise

Rank	Learning Style Variables	Percentage of Students Who Preferred the Variable
1	Intake Not Required	71.2
2	Learning With Adults	57.2
3	Low Persistence	51.6
4	Formal Design	49.8
5	Visual Preferences	43.9
6	Needs Structure	40.4
7	Auditory Preferences	39.3
8.5	Morning Best	38.2
8.5	Late Morning Best	38.2
10	Late Morning Not Best	35.8
11	Learning Several Ways	34.0
12	Peer Oriented Learner	33.0
13	Tactile Prefernces	30.9
14	Not Adult-Motivated	28.4
15	Warm Temperature	28.1
16.5	Low Responsibility	26.7
16.5	Independent of Adults	26.7
18	Learning Aone Not Preferred	26.3

preferred not to be mobile, probably to remain seated in their desks, definitely without food or drink, in a bright, quiet, and warm environment, and to learn with their peers while they watched and listened to their teachers teach. They liked to manipulate the materials with which they worked. The variable of motivation was difficult to define; students tended to be ambivalent in the areas of motivation. They showed a preference for being not adult-motivated. Other variables of learning style which were

important for educational practise were the variables of low persistence and low responsibility. The best time of day for learning could not be defined with certainty other than to say that the majority of students preferred learning before noon.

No learning style variables were, however, preferred by 100 percent of the students. Thus, even though there were 18 learning style variables which were defined as being sufficiently prevalent to be important for educational practise, there were students who did not prefer these variables. There were students who preferred mobility, an informal design and no structure and who had high persistence and high responsibility preferences. In the learning style variable for which the highest degree of student preference was expressed, the area of food intake required or not required, where 71.2 percent of the students preferred not to have food intake while they studied, 4.2 percent of the students preferred to have food intake while they studied. Even though several learning style variables were recognized as being important for educational practise, there were a large number of students whose needs were not met by these variables.

Differences in Learning Style Among the Schools

This subsection addresses Question 2--"Are there learning style differences among the three study sample schools in the study?"

This question is related to the previous question on learning style variables which are important for educational practise. If there are no significant learning style differences

among schools, then the results should be fully generalizable to all students in the study population; if there are significant learning style differences, then the results are probably not fully generalizable to all the students in this study.

Student preferences for learning style variables for each school in the sample are presented in Table 12 (page 75) and Appendix D (page 151).

Significant differences in student preferences were found to exist in 20 areas of learning style among the School A, School B, and School C students. The areas in which no significant differences were found are: self-motivation, structure, visual preferences, and late morning.

School A students had the significantly greatest preference for low light and the lowest preference for warm temperature. They had the highest preference for sound when they studied. School B students most preferred bright light when they studied.

School B students had the significantly lowest preference for formal design in their studies while School C students had the highest preference. School B students tended to be least likely to be motivated by adults, while School A students showed the lowest degree of preference for not being adult-motivated. School A students least preferred learning alone. School A students were the most peer-oriented, while School B students were the least peer-oriented. School A students most preferred working with adults while School B students were the most independent of adults.

TABLE 12

Comparison of Percentage of Total LSI Responses
With Percentage of LSI Responses per School

LSI Variable Standard Score 60 or Higher	Total	School A	School B	School C
1. Sound Preferred	4.9	7.9	2.4	4.5
2. Bright Light	23.5	23.6	28.2	19.8
3. Warm Temperature	28.1	23.6	30.6	29.7
4. Formal Design	49.8	41.6	37.6	65.8
5. Self-Motivated	-	-	-	-
6. Adult-Motivated	-	-	-	-
7. Teacher-Motivated	-	-	-	-
8. High Persistence	15.8	20.2	16.5	11.7
9. High Responsibility	15.1	21.3	14.1	10.8
10. Needs Structure	40.4	42.7	41.2	37.8
11. Prefers Working Alone	18.6	14.6	21.2	19.8
12. Peer Oriented Learner	33.0	36.0	27.1	35.1
13. Learning With Adults	57.2	66.3	48.2	56.8
14. Learning Several Ways	34.0	42.7	29.4	30.6
15. Auditory Preferences	39.3	39.3	30.6	45.9
16. Visual Preferences	43.9	43.8	41.2	45.9
17. Tactile Preferences	30.9	32.6	18.8	38.7
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	4.2	2.2	7.1	3.6
20. Morning Best	38.2	36.0	34.1	43.2
21. Late Morning Best	38.2	37.1	40.0	37.8
22. Afternoon Best	23.2	27.0	20.0	22.5
23. Evening Best	6.0	3.4	4.7	9.0
24. Mobility Needed	3.2	-	3.5	5.4
Number of Students	285	89	85	111

LSI Variable Standard Score 40 or Lower	Total	School A	School B	School C
1. Quiet Preferred	12.6	9.0	15.3	13.5
2. Low Light	10.9	14.6	8.2	10.8
3. Cool Temperature	9.5	10.1	8.2	10.8
4. Informal Design	1.1	-	2.4	0.9
5. Not Self-Motivated	4.2	2.2	5.9	4.5
6. Not Adult-Motivated	28.4	22.5	35.3	27.9
7. Not Teacher-Motivated	9.5	10.1	12.9	6.3
8. Low Persistence	51.6	43.8	47.1	61.3
9. Low Responsibility	26.7	22.5	29.4	27.9
10. Structure Not Preferred	2.5	1.1	2.4	3.6
11. Learning Alone Not Preferred	26.3	29.2	22.4	27.0
12. Not Peer Oriented	15.8	13.5	16.5	17.1
13. Independent of Adults	26.7	20.2	30.6	28.8
14. Several Ways Not Preferred	6.0	5.6	5.9	6.3
15. No Auditory Preferences	7.0	6.7	10.6	4.5
16. No Visual Preferences	3.8	2.2	5.9	3.6
17. No Tactile Preferences	9.8	10.1	18.8	2.7
18. No Kinesthetic Preferences	15.4	10.1	21.2	15.3
19. Intake Not Required	71.2	77.5	58.8	75.7
20. Morning Not Best	11.6	11.2	9.4	13.5
21. Late Morning Not Best	35.8	37.1	35.3	35.1
22. Afternoon Not Best	23.5	20.2	27.1	23.4
23. Evening Not Best	6.7	9.0	8.2	3.6
24. Mobility Not Needed	22.1	12.4	30.6	23.4
Number of Students	285	89	85	111

There were significant differences in the areas of persistence and responsibility. School A students had the highest high persistence and the least low persistence preferences. School C students had the lowest high persistence and the lowest low persistence preferences. School A students had the most high responsibility preferences and the least low responsibility preferences. School C students had the lowest high responsibility preferences, while School C and School B students had equally low responsibility preferences. In general, School A students showed the greatest tendency for high responsibility and high persistence preferences, while School C students showed the greatest tendency for low responsibility and low persistence preferences.

There were significant differences in preferences for ways of learning. School A students most preferred learning through several ways. School B and School C students least preferred learning through several ways. School C students had the greatest degree of preference for auditory methods of presentation, while School B students had the lowest preference for auditory methods. School B students had the least preference for visual methods and the lowest significant preference for tactile methods of presentation. School C students had the highest degree of preference for tactile methods of presentation. School B students had the highest preference for no kinesthetic methods of presentation, while School A students had the lowest preference for no kinesthetic methods of presentation.

School A students were least likely to prefer food intake as

they studied, while School B students were the most likely to prefer food intake as they studied.

Studying during the morning was most preferred by students at School C. Studying during the afternoon was most preferred by School A students and least preferred by School B students. School B students were most inclined to study in the late morning. School C students most liked studying in the evening while School A students were least inclined to study in the evening.

There were significant differences in the requirement for being not mobile among the three schools. School B students had the highest degree of preference for not needing mobility, while School A students had the lowest degree of preference for not requiring mobility.

Comparison of Rank Order

Learning style variables in which there was a significant difference were placed in rank order. The 12 variables in each category for which the highest percentage preference was shown are presented in Table 13 (page 78).

There were several differences in the rank order of the most preferred learning style variables among the schools.

Summary of Differences

Several significant differences for student preferences for variables of learning style were found among the three schools in the study sample.

TABLE 13

Rank Order of Learning Style Variables Among the Three Study Sample Schools

Rank	Schools A	%	Schools B	%	Schools C	%
1	Intake Not Required	77.5	Intake Not Required	58.8	Intake Not Required	75.7
2	Learning With Adults	66.3	Learning With Adults	48.2	Low Persistence	61.3
3	Low Persistence	43.8	Low Persistence	47.1	Formal Design	65.8
4	Learning Several Ways	42.7	Formal Design	37.6	Learning With Adults	56.8
5	Formal Design	41.6	Not Adult-Motivated	35.3	Auditory Preferences	45.9
6	Auditory Preferences	39.3	Morning Best	34.1	Morning Best	43.2
7	Peer Oriented Learner	36.0	Warm Temperature	30.6	Tactile Preferences	38.7
8	Morning Best	36.0	Auditory Preferences	30.6	Peer Oriented Learner	35.1
9	Tactile Preferences	32.6	Independent of Adults	30.6	Learning Several Ways	30.6
10	Learning Alone Not Preferred	29.2	Mobility Not Needed	30.6	Warm Temperature	29.7
11	Afternoon Best	27.0	Learning Several Ways	29.4	Independent of Adults	29.8
12	Bright Light	23.6	Low Responsibility	29.4	Not Adult-Motivated	27.9
	Warm Temperature	23.6			Low Responsibility	27.9

School C students had the highest preference for formal design and the lowest preference for high responsibility and high persistence. They learned best through auditory and tactile methods of presentation. They liked learning in the morning and showed the greatest tendency to prefer learning in the evening.

School B students most preferred light. They least preferred formal design, were least motivated by adults, were least peer oriented, and were most independent of adults. They had the lowest preference for high responsibility and were least likely to prefer learning through several ways. They were least likely to prefer auditory, visual, tactile, or kinesthetic methods of presentation. School B students were the most likely to require food while they studied. They were most inclined to prefer studying in the morning and least inclined towards studying in the afternoon. They were least in need of mobility when they studied.

School A students had the greatest preference for low light and the lowest preference for warmth. They showed the least tendency for not being adult-motivated. They most preferred to work with their peers or with adults. They had the highest high persistence and responsibility preferences. School A students had the greatest preference for learning several ways, although there was no significant preference for any method of presentation. They were least likely to require food intake as they studied, and had the greatest preference for studying in the afternoon. School A students were least likely not to need mobility and not to prefer kinesthetic methods of presentation.

Differences in Learning Style Between Male and Female Students

This subsection addresses Question 3--"Are there learning style differences between male and female students?"

Male and female preferences for variables of learning style are presented in Table 14 (page 81) and Appendix D (page 152).

Significant differences between male and female students in learning style variable preferences were found in 10 learning style variables which are listed in Table 15 (page 82).

More male students preferred bright light and formal design. Female students tended to have higher high responsibility preferences while males had higher high persistence preferences. Males require more structure than did female students.

Males preferred to learn through several ways more than did females. Males had the greater preference for learning through visual methods while females had the greater preference for learning through auditory methods. More males liked learning in late morning best, while females were less inclined to require mobility when they studied.

Other differences in preferences were noted. Female students had a greater tendency to prefer sound and warmth when they studied. More female students preferred learning alone than did male students. Male students were more peer-oriented while female students tended to be more adult-oriented. Female students had a greater tendency to prefer tactile methods of presentation while male students had the greater tendency not to have kinesthetic

TABLE 14

Comparison of Percentage of Total Number of LSI Responses With Percentage of Number of LSI Responses for Males and Females

LSI Variable Standard Score 60 or Higher	Total	Sex M	Sex F
1. Sound Preferred	4.9	4.2	5.6
2. Bright Light	23.5	28.7	18.3
3. Warm Temperature	28.1	25.2	31.0
4. Formal Design	49.8	53.8	45.8
5. Self-Motivated	-	-	-
6. Adult-Motivated	-	-	-
7. Teacher-Motivated	-	-	-
8. High Persistence	15.8	16.8	14.8
9. High Responsibility	15.1	12.6	17.6
10. Needs Structure	40.4	43.4	37.3
11. Prefers Working Alone	18.6	17.5	18.6
12. Peer Oriented Learner	33.0	35.0	31.0
13. Learning With Adults	57.2	54.5	59.9
14. Learning Several Ways	34.0	37.8	30.3
15. Auditory Preferences	39.3	36.4	42.3
16. Visual Preferences	43.9	49.7	38.0
17. Tactile Preferences	30.9	28.0	33.8
18. Kinesthetic Preferences	-	-	-
19. Intake Required	4.2	5.6	2.8
20. Morning Best	38.2	38.5	38.0
21. Late Morning Best	38.2	41.3	35.2
22. Afternoon Best	23.2	24.5	21.8
23. Evening Best	6.0	7.0	4.9
24. Mobility Needed	3.2	3.5	2.8
Number of Students	285	143	142

LSI Variable Standard Score 40 or Lower	Total	Sex M	Sex F
1. Quiet Preferred	12.6	13.4	12.0
2. Low Light	10.9	9.8	12.0
3. Cool Temperature	9.5	9.1	9.9
4. Informal Design	1.1	-	2.1
5. Not Self-Motivated	4.2	4.9	3.5
6. Not Adult-Motivated	28.4	29.4	27.5
7. Not Teacher-Motivated	9.5	9.1	9.9
8. Low Persistence	51.6	55.2	47.9
9. Low Responsibility	26.7	35.0	18.3
10. Structure Not Preferred	2.5	2.8	2.1
11. Learning Alone Not Preferred	26.3	28.7	23.9
12. Not Peer Oriented	15.8	14.7	16.9
13. Independent of Adults	26.7	26.6	26.8
14. Several Ways Not Preferred	6.0	7.7	4.2
15. No Auditory Preferences	7.0	8.4	5.6
16. No Visual Preferences	3.8	4.2	3.5
17. No Tactile Preferences	9.8	8.4	11.3
18. No Kinesthetic Preferences	15.4	18.2	12.7
19. Intake Not Required	71.2	72.0	70.4
20. Morning Not Best	11.6	9.8	13.4
21. Late Morning Not Best	35.8	34.3	37.3
22. Afternoon Not Best	23.5	25.2	21.8
23. Evening Not Best	6.7	6.3	7.0
24. Mobility Not Needed	22.1	16.8	27.5
Number of Students	285	143	142

preferences. Males were more inclined to require food intake and to favour learning in the evening more than females.

Comparison of Rank Order

Learning style variables in which there was a significant difference were placed in rank order. The ten variables in each category are presented in Table 15.

TABLE 15

Rank Order of Learning Style Variables of Male and Female Students

Rank	Sex			
	Male		Female	
	LSI Variable	Percentage	LSI Variable	Percentage
1	Low Persistence	55.2	Low Persistence	47.9
2	Formal Design	53.8	Formal Design	45.8
3	Visual Preferences	49.7	Auditory Preference	42.3
4	Late Morning Best	41.3	Visual Preferences	38.0
5	Needs Structure	43.4	Needs Structure	37.3
6	Learning Several Ways	37.8	Late Morning Best	35.2
7	Auditory Preferences	36.4	Learning Several Ways	30.3
8	Low Responsibility	35.0	Mobility Not Needed	27.5
9	Bright Light	28.7	Bright Light	18.3
10	Mobility Not Needed	16.8	Low Responsibility	18.3

Several differences were found in the rank order of significantly different learning style variables between male and female students.

Summary of Differences

Significant differences between male and female students were found in their preferences for several variables of learning style. Males preferred more bright light, formal design, structure, learning through several ways, learning through visual methods and learning in the late morning. Females were less likely to have low responsibility and low persistence preferences, and required less mobility. Females preferred learning more through visual methods. Other differences and tendencies were noted.

Differences Among the Various Grade Levels

This subsection addresses Question 4--"Are there learning style differences among elementary grade students, junior high students, and senior high students?"

Student preferences for learning style variables in the three school grade categories are presented in Table 16 (page 84) and Appendix D (page 153).

Significant differences in student preferences among the three grade categories were found in 21 learning style areas. The areas in which no significant differences were found are: self-motivation, persistence, and teacher motivation.

Senior high students had the highest preference for quiet, low light, and warm temperature. Elementary grade students least preferred quiet and had the highest degree of preference for bright light and cool temperature.

TABLE 16

Comparison of Percentage of Total Number of LSI Responses
With Percentage of LSI Responses per Grade Level

LSI Variable Standard Score 60 or Higher	Total	Grade Level 4,5,6	7,8	9,10
1. Sound Preferred	4.9	5.0	5.5	3.7
2. Bright Light	23.5	24.3	23.1	22.2
3. Warm Temperature	28.1	25.7	26.4	37.0
4. Formal Design	49.8	37.9	62.9	59.3
5. Self-Motivated	-	-	-	-
6. Adult-Motivated	-	-	-	-
7. Teacher-Motivated	-	-	-	-
8. High Persistence	15.8	16.4	14.3	16.7
9. High Responsibility	15.1	13.6	19.8	11.1
10. Needs Structure	40.4	41.4	36.3	44.4
11. Prefers Working Alone	18.6	13.6	24.2	22.2
12. Peer Oriented Learner	33.0	42.9	26.4	18.5
13. Learning With Adults	57.2	67.1	53.8	37.0
14. Learning Several Ways	34.0	40.0	35.2	16.7
15. Auditory Preferences	39.3	33.6	40.7	51.9
16. Visual Preferences	43.9	50.0	38.5	37.0
17. Tactile Preferences	30.9	35.0	28.6	24.1
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	4.2	1.4	4.4	11.1
20. Morning Best	38.2	57.1	23.1	14.8
21. Late Morning Best	38.2	49.3	33.0	18.5
22. Afternoon Best	23.2	27.9	19.8	16.7
23. Evening Best	6.0	-	-	31.5
24. Mobility Needed	3.2	-	-	16.6
Number of Students	285	140	91	54

LSI Variable Standard Score 40 or Lower	Total	Grade Level 4,5,6	7,8	9,10
1. Quiet Preferred	12.6	10.0	14.3	16.7
2. Low Light	10.9	2.9	17.6	20.4
3. Cool Temperature	9.5	10.0	9.9	7.4
4. Informal Design	1.1	0.7	1.1	1.9
5. Not Self-Motivated	4.2	5.7	2.2	3.7
6. Not Adult-Motivated	28.4	22.8	28.6	29.6
7. Not Teacher-Motivated	9.5	5.7	16.5	7.4
8. Low Persistence	51.6	52.9	50.5	50.0
9. Low Responsibility	26.7	21.4	31.9	31.5
10. Structure Not Preferred	2.5	1.4	5.5	-
11. Learning Alone Not Preferred	26.3	34.3	24.2	9.3
12. Not Peer Oriented	15.8	11.4	18.7	22.2
13. Independent of Adults	26.7	16.4	28.6	50.0
14. Several Ways Not Preferred	6.0	5.7	6.6	5.6
15. No Auditory Preferences	7.0	6.4	8.8	5.6
16. No Visual Preferences	3.8	2.1	4.4	7.4
17. No Tactile Preferences	9.8	8.6	12.1	9.3
18. No Kinesthetic Preferences	15.4	17.1	15.4	11.1
19. Intake Not Required	71.2	75.0	69.2	64.8
20. Morning Not Best	11.6	2.1	16.5	27.8
21. Late Morning Not Best	35.8	25.0	39.6	57.4
22. Afternoon Not Best	23.5	24.3	24.2	20.4
23. Evening Not Best	6.7	5.0	7.7	9.3
24. Mobility Not Needed	22.1	19.3	15.4	40.7
Number of Students	285	140	91	54

Code: Elementary - Grade 4, 5, 6; Junior High - Grade 7, 8; Senior High - Grade 9, 10.

Junior high students had the highest degree of preference for formal design in their classroom, while elementary students had the lowest preference for formal design.

Junior high students were most not teacher-motivated while elementary students were the least not teacher-motivated. There was a tendency to being more not adult-motivated as grade level increased.

With the exception of junior high students, a high percentage of the students preferred to learn alone; the tendency was for students to prefer learning alone as grade level increased. Elementary students were most peer-oriented while senior high students were least peer-oriented. Elementary grade students most preferred working with adults while senior high students most preferred learning independently of adults.

Junior high students least preferred structure while senior high students most preferred structure in their studies.

Junior high students had the highest high responsibility and also the highest low responsibility preferences. Generally, elementary students tended to have higher high responsibility preferences than senior high students.

As grade level increased there were significant differences in preferred ways of learning. Elementary grade students most preferred learning through several ways while senior high students least preferred learning through several ways. Junior high students most preferred learning through auditory methods of presentation while elementary students most preferred learning through visual and

tactile methods of presentation. Elementary grade students had the highest degree of preference for no kinesthetic methods of presentation.

The need for food intake increased as grade level increased with the senior high students most in need of food intake as they studied and least not in need of food intake.

Elementary students preferred morning, late morning and afternoon but while senior high students were the only students who preferred learning in the evening, senior high students most preferred not to learn best in either morning or late morning. In general, as grade level increased, there was an increased amount of preference for learning in the afternoon and evening.

Mobility was both most required and most not required by senior high students. Junior high students had the least preference for not needing mobility.

Comparison of Rank Order

Learning style variables in which there was a significant difference were placed in rank order. The 12 variables in each category for which the highest percentage preference was expressed are presented in Table 17 (page 87).

Several differences were found in the rank order of significantly different learning style variables among elementary, junior high and senior high students.

TABLE 17

Rank Order of Learning Style Variable Preferences of Elementary, Junior High and Senior High Students

Rank	Grade Category: Elementary		Junior High		Senior High	
	LSI Variable	Percentage	LSI Variable	Percentage	LSI Variable	Percentage
1	Intake Not Required	75.0	Intake Not Required	69.2	Intake Not Required	64.8
2	Learning With Adults	67.1	Formal Design	62.9	Formal Design	59.3
3	Morning Best	57.1	Learning With Adults	53.8	Late Morning Not Best	57.4
4	Visual Preferences	50.0	Auditory Preferences	40.7	Auditory Preferences	51.9
5	Late Morning Best	49.3	Late Morning Not Best	39.6	Independent of Adults	50.0
6	Peer Oriented Learner	42.9	Visual Preferences	38.5	Needs Structure	44.4
7	Needs Structure	41.4	Needs Structure	36.3	Mobility Not Needed	40.7
8	Learning Several Ways	40.0	Learning Several Ways	35.2	Warmp Temperature	37.0
9	Formal Design	37.9	Late Morning Best	33.0	Learning With Adults	37.0
10	Tactile Preferences	35.0	Low Responsibility	31.9	Visual Preferences	37.0
11	Learning Alone Not Preferred	34.3	Tactile Preferences	28.6	Evening Best	31.5
12	Auditory Preferences	33.6	Independent of Adults	28.6	Low Responsibility	31.5

Summary of Differences

There were a large number of significant differences in preferences for areas of learning style among the three grade categories.

In general, as grade level increased, preferences for quiet, low light, warm temperature, learning alone, auditory methods, food intake and later time of day increased and preferences for being peer-oriented, working with adults, having high responsibility, learning through several ways, learning through visual methods, learning through tactile methods, and not learning through kinesthetic methods decreased.

Junior high students had several unique learning style variable preferences. They had the highest degree of preference for formal design, being not teacher-motivated, and learning alone; and had the highest degree of preference for structure.

Differences Among Academic Achievement Categories

This subsection addresses Question 5--"Are there learning style differences among students whose academic achievement is excellent, students whose academic achievement is average, and students whose academic achievement is below-average?"

Student preferences for learning style variables in the three academic achievement categories are presented in Table 18 (page 89) and Appendix D (page 154).

Significant differences in student preferences among the three academic achievement categories were found in 17 learning

TABLE 18

Comparison of Percentage of Total Number of LSI Responses
With Percentage of LSI Responses for Each Academic Achievement Level

LSI Variable Standard Score 60 or Higher	Total	Achievement		
		Ex.	Av.	BAv.
1. Sound Preferred	4.9	6.9	3.6	5.2
2. Bright Light	23.5	21.8	24.3	25.9
3. Warm Temperature	28.1	36.8	26.4	19.0
4. Formal Design	49.8	59.8	47.9	39.7
5. Self-Motivated	-	-	-	-
6. Adult-Motivated	-	-	-	-
7. Teacher-Motivated	-	-	-	-
8. High Persistence	15.8	24.1	12.1	12.1
9. High Responsibility	15.1	28.7	10.7	5.2
10. Needs Structure	40.4	41.4	40.7	37.9
11. Prefers Working Alone	18.6	16.1	22.9	12.1
12. Peer Oriented Learner	33.0	28.7	32.1	41.4
13. Learning With Adults	57.2	46.0	64.3	56.9
14. Learning Several Ways	34.0	25.3	37.1	39.7
15. Auditory Preferences	39.3	35.6	37.9	48.2
16. Visual Preferences	43.9	40.2	47.1	41.4
17. Tactile Preferences	30.9	31.0	30.0	32.8
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	4.2	5.7	3.6	3.4
20. Morning Best	38.2	44.8	36.4	32.8
21. Late Morning Best	38.2	32.2	38.6	46.6
22. Afternoon Best	23.2	20.7	25.7	20.7
23. Evening Best	6.0	5.7	5.0	8.6
24. Mobility Needed	3.2	3.4	2.1	5.2
Number of Students	285	87	140	58

LSI Variable Standard Score 40 or Lower	Total	Achievement		
		Ex.	Av.	BAv.
1. Quiet Preferred	12.6	17.2	12.9	5.2
2. Low Light	10.9	14.9	8.6	11.5
3. Cool Temperature	9.5	13.8	6.3	11.5
4. Informal Design	1.1	1.1	0.7	1.7
5. Not Self-Motivated	4.2	4.6	2.9	6.9
6. Not Adult-Motivated	28.4	28.7	25.7	34.5
7. Not Teacher-Motivated	9.5	10.3	8.6	11.5
8. Low Persistence	51.6	42.5	52.9	62.1
9. Low Responsibility	26.7	18.4	29.3	32.8
10. Structure Not Preferred	2.5	3.4	2.1	1.7
11. Learning Alone Not Preferred	26.3	21.8	25.7	34.5
12. Not Peer Oriented	15.8	13.8	17.9	31.0
13. Independent of Adults	26.7	36.8	22.1	22.4
14. Several Ways Not Preferred	6.0	4.6	5.7	8.6
15. No Auditory Preferences	7.0	5.7	8.6	5.2
16. No Visual Preferences	3.8	4.6	2.9	5.2
17. No Tactile Preferences	9.8	11.5	9.3	8.6
18. No Kinesthetic Preferences	15.4	14.9	16.4	13.8
19. Intake Not Required	71.2	73.6	71.4	67.2
20. Morning Not Best	11.6	11.5	14.2	5.2
21. Late Morning Not Best	35.8	50.6	30.7	25.9
22. Afternoon Not Best	23.5	26.4	23.6	20.7
23. Evening Not Best	6.7	6.9	5.7	8.6
24. Mobility Not Needed	22.1	36.8	16.4	13.8
Number of Students	285	87	140	58

Achievement Code: Ex. = Excellent; Av. = Average; BAv. = Below Average

style areas. Areas in which no significant differences were found are: self-motivation, teacher-motivation, structure needs, tactile preferences, kinesthetic preferences, afternoon and evening.

Excellent achieving students most preferred quiet, low light, and a warm temperature. However, excellent achieving students also showed the greatest preference for sound when they studied and for a cool temperature.

Excellent achievers showed the highest preference for a formal classroom design while below-average achievers showed the lowest preference for formal design.

In the variables of motivation, the average achievers showed the least low motivation preferences; that is, not to be adult-motivated and not to be teacher-motivated, while the below-average achievers showed the highest degree of not having any preference for these variables. Average achievers had the highest preference for learning alone and/or learning with adults. Below-average achievers showed the most preference for not learning alone; they showed the highest degree of preference for working with their peers and showed a strong tendency to prefer working with adults. A large number of below-average achievers, however, indicated a preference not to work with their peers.

The areas of responsibility and persistence greatly distinguished between students in the three achievement categories. Excellent achievers showed the highest preferences for the variables of high persistence and high responsibility, while below-average achievers showed the lowest preference for these variables.

Similarly, the below-average achievers were most inclined to have the highest low responsibility and low persistence variables.

Excellent achievers showed the most preference for needing structure, although there was not a high degree of difference in preference for structure among the three achievement groups.

Below-average achieving students most preferred learning through several ways and most preferred learning through auditory methods. Average achievers showed the greatest preference for learning through visual methods. Excellent achievers were least inclined to learn through several ways and through visual and auditory methods. No significant differences were noted in tactile preferences although there was a definite trend which showed that below-average students had the highest degree of preference for tactile methods of presentation.

Excellent achievers preferred most to require intake and most not to require intake.

Excellent achievers had the highest preference for learning best in the morning and the lowest preference for learning in the late morning. Late morning was most preferred by below-average achievers. Average achievers tended to find the morning not the best time to study. However, they indicated strong preferences for learning in the morning and the late morning.

Below-average achievers most required mobility while excellent achievers most preferred not to need mobility.

Comparison of Rank Order

Learning style variables in which there was a significant difference were placed in rank order. The 12 variables in each category which had the highest percentage preference expressed are presented in Table 19 (page 93).

Several differences were found in the rank order of significantly different learning style variables among excellent achievers, average achievers and below-average achievers.

Summary of Differences

Significant differences in preferences for variables of learning style were found among students in the three academic categories.

The greatest differences between excellent achievers and below-average achievers were found in nine learning style variables. Excellent achievers preferred a warmer temperature, did not need mobility, had the higher high persistence and high responsibility preferences, required more formal design, liked late morning better and late morning less, were more independent of adults, and less preferred learning through several ways than did below-average achievers. The learning style variables of warm temperature, not needing mobility and having high responsibility and high persistence preferences were the variables which distinguished most between excellent achieving students and below-average achieving students.

Below-average achieving students least preferred a warm temperature, least preferred not to need mobility and had the lowest

TABLE 19

Rank Order of Learning Style Variable Preferences
of Excellent, Average, and Below-Average Academic Achievement Students

Rank	Academic Achievement Categories					
	Excellent		Average		Below Average	
	LSI Variable	Percentage	LSI Variable	Percentage	LSI Variable	Percentage
1	Intake Not Required	73.6	Intake Not Required	71.4	Intake Not Required	67.2
2	Formal Design	59.8	Learning With Adults	64.3	Low Persistence	62.1
3	Late Morning Not Best	50.6	Low Persistence	52.9	Learning With Adults	56.9
4	Learning With Adults	46.0	Formal Design	47.9	Auditory Preferences	48.2
5	Morning Best	44.8	Visual Preferences	47.1	Late Morning Best	46.6
6	Low Persistence	42.5	Needs Structure	40.7	Peer Oriented Learner	41.4
7	Needs Structure	41.4	Late Morning Best	38.6	Visual Preferences	41.4
8	Visual Preferences	40.2	Auditory Preferences	37.9	Formal Design	39.7
9	Warm Temperature	36.8	Learning Several Ways	37.1	Learning Several Ways	39.7
10	Independent of Adults	36.8	Morning Best	36.4	Needs Structure	37.9
11	Mobility Not Needed	36.8	Peer Oriented Learner	32.1	Not Adult-Motivated	34.5
12	Auditory Preferences	35.6	Late Morning Not Best	30.7	Learning Alone Not Preferred	34.5

high responsibility and high persistence preferences. They least required formal design, liked late morning most, most preferred learning through several ways, and showed the greatest preference for learning through auditory methods.

Average achieving students were distinguished most in the variables of motivation and preference for learning with others. They were least low motivated, least not adult-motivated, least not teacher-motivated, and showed the greatest preferences for learning alone and for learning with adults. They showed the highest preference for visual methods and for learning in the afternoon.

Differences Among School Attendance Categories

This subsection addresses Question 6--"Are there learning style differences among students whose school attendance is high, students whose school attendance is medium, and students whose school attendance is low?"

Student preferences for learning style variables in the three school attendance categories are presented in Table 20 (page 95) and Appendix D (page 155). The results of only 23 students are considered in the low school attendance category.

Significant differences in student preferences among the three school attendance categories were found in 23 learning style areas. Preference for a formal or an informal setting was the only learning style area where no significant difference was found.

Students who were medium attenders; that is, those students who attended school between 60 and 80 percent of the time, had the

TABLE 20

Comparison of Percentage of Total Number of LSI Responses
With Percentage of LSI Responses for Each School Attendance Level

LSI Variable Standard Score 60 or Higher	Total	Attendance High	Med.	Low	LSI Variable Standard Score 40 or Lower	Total	Attendance High	Med.	Low
1. Sound Preferred	4.9	6.2	2.4	4.3	1. Quiet Preferred	12.6	14.0	9.5	13.0
2. Bright Light	23.5	25.8	19.1	21.7	2. Low Light	10.9	10.7	13.1	4.3
3. Warm Temperature	28.1	28.1	32.1	13.0	3. Cool Temperature	9.5	10.1	7.1	13.0
4. Formal Design	49.8	50.0	50.0	47.8	4. Informal Design	1.1	1.1	1.2	-
5. Self-Motivated	-	-	-	-	5. Not Self-Motivated	4.2	3.4	7.1	-
6. Adult-Motivated	-	-	-	-	6. Not Adult-Motivated	28.4	30.3	25.0	26.1
7. Teacher-Motivated	-	-	-	-	7. Not Teacher-Motivated	9.5	6.2	16.7	8.7
8. High Persistence	15.8	14.6	17.9	17.4	8. Low Persistence	51.6	53.4	47.1	47.8
9. High Responsibility	15.1	16.9	14.3	4.3	9. Low Responsibility	26.7	28.7	20.2	34.8
10. Needs Structure	40.4	42.7	39.3	26.1	10. Structure Not Preferred	2.5	3.4	1.2	-
11. Prefers Working Alone	18.6	16.3	20.2	30.4	11. Learning Alone Not Preferred	26.3	27.0	27.2	17.4
12. Peer Oriented Learner	33.0	33.7	34.5	21.7	12. Not Peer Oriented	15.8	14.6	15.5	26.1
13. Learning With Adults	57.2	56.2	52.4	82.6	13. Independent of Adults	26.7	28.1	27.4	13.0
14. Learning Several Ways	34.0	32.6	34.5	43.5	14. Several Ways Not Preferred	6.0	6.7	3.6	8.7
15. Auditory Preferences	39.3	39.3	41.7	30.4	15. No Auditory Preferences	7.0	4.5	13.1	4.3
16. Visual Preferences	43.9	46.6	31.8	43.5	16. No Visual Preferences	3.8	4.5	3.6	-
17. Tactile Preferences	30.9	28.7	35.7	30.4	17. No Tactile Preferences	9.8	7.9	14.3	8.7
18. Kinesthetic Preferences	-	-	-	-	18. No Kinesthetic Preferences	15.4	15.7	16.7	8.7
19. Intake Required	4.2	3.9	6.0	-	19. Intake Not Required	71.2	69.1	72.6	82.6
20. Morning Best	38.2	35.4	36.9	65.2	20. Morning Not Best	11.6	11.8	14.3	-
21. Late Morning Best	38.2	39.9	34.5	39.1	21. Late Morning Not Best	35.8	37.6	35.7	21.7
22. Afternoon Best	23.2	22.5	19.0	43.5	22. Afternoon Not Best	23.5	24.7	22.6	17.4
23. Evening Best	6.0	7.9	3.6	-	23. Evening Not Best	6.7	4.5	9.5	13.0
24. Mobility Needed	3.2	4.5	1.2	-	24. Mobility Not Needed	22.1	23.0	23.8	8.7
Number of Students	285	178	84	23	Number of Students	285	178	84	23

Attendance Categories Code: High = 80% - 100%; Medium = 60% - < 80%; Low = < 60%.

lowest preference for sound and the lowest preference for quiet when they studied. Students who were high attenders; that is, those students who attended school between 80 and 100 percent of the time, had the highest preference for sound and the highest preference for quiet.

Medium attenders tended to prefer low light while they studied. They had the lowest preference for bright light and the highest preference for low light. High attenders had the highest preference for bright light, while low attenders; that is, those students whose school attendance was below 60 percent, had the lowest preference for low light.

Medium attenders tended to prefer a warm temperature while they studied; they had the highest preference for a warm temperature and the lowest preference for a cool temperature. Low attenders tended to prefer a cool temperature while they studied; they had the lowest preference for a warm temperature and the highest preference for a cool temperature.

Medium attenders expressed the highest preference for not being self-motivated while the low attenders had the lowest preference for not being self-motivated. High attenders were the most not adult-motivated while medium attenders were the least not adult-motivated. However, medium attenders were the most not teacher-motivated while high attenders were the least not teacher-motivated.

Low attenders had a tendency not to prefer learning alone; they had the highest preference for learning alone and the lowest

preference for not learning alone. High attenders had a tendency not to prefer learning alone; they had the lowest preference for learning alone and a very high preference for not learning alone.

Low attenders had a tendency not to be peer oriented; they least preferred learning with peers and had the highest preference for not being peer oriented. Medium and high attenders were equally peer oriented and very much more peer oriented than were low attenders.

Low attenders exhibited a very high preference for learning with adults; 82.6 percent of all low attenders had expressed a preference for learning with adults. (82.6 percent is the highest preference for a learning style variable exhibited by any group in this study.) They had the lowest preference for learning independently of adults. Medium and high attenders were about equal in their preference for working with adults.

Low attenders had the least high responsibility preferences. Low attenders showed the lowest preference for high responsibility and the highest preference for low responsibility. High attenders had the highest preference for high responsibility while medium attenders had the least preference for low responsibility.

Low attenders least needed structure while high attenders most needed structure.

Low attenders had the highest preference for learning in several ways. High attenders had the lowest preference for learning in several ways.

Medium attenders had the highest preference for auditory methods and the highest preference for no auditory methods. Low attenders had the lowest preference for auditory methods.

High attenders had the highest preference for visual methods of presentation while medium attenders had the lowest preference for visual methods of presentation.

Medium attenders had the highest preference for both tactile and no tactile methods. High attenders had the lowest preference for tactile methods, although high and low attenders were about equal in their preference for tactile methods.

Medium attenders had the most dislike for kinesthetic methods while low attenders had the least dislike for kinesthetic methods. However, medium and high attenders were about equal in their dislike.

Low attenders least required intake as they studied; 82.6 percent of all low attenders did not require intake. Medium and high attenders were about equal in their intake requirements.

The highest preference for studying in the morning was expressed by low attenders. Medium and high attenders had an almost equal preference for learning in the morning.

Low attenders had a tendency to prefer learning in the afternoon. They had the highest preference for learning in the afternoon and the lowest preference for not learning in the afternoon. Medium attenders least preferred learning in the afternoon.

High attenders expressed the highest preference for learning

in the evening while low attenders expressed the lowest preference for learning in the evening.

It was difficult to differentiate mobility needs among the three categories except to state that low attenders appeared to be less concerned with mobility.

Medium attenders appeared to have special needs and preferences. They expressed the highest or the lowest preferences in 28 of the 39 learning style variables where significant preferences were distinguished. They appeared to be quite similar to high attenders in many respects but differed in several ways. Medium attenders tended to be more tactile and less visual, needed less light, needed warm temperatures, and were less teacher-motivated than were high attenders.

Comparison of Rank Order

The learning style variables in which there was a significant difference were placed in rank order. The 12 variables for which the highest percentage preference was expressed are presented in Table 21 (page 100).

Several differences were found in the rank order of significantly different learning style variables among high attendance students, medium attendance students and low attendance students.

Summary of Differences

There were significant differences in student preferences for most learning style variables among the three attendance

TABLE 21

Rank Order of Learning Style Variable Preferences of High, Medium and Low School Attendance Students

Rank	School Attendance Category: High		Medium		Low	
	LSI Variable	Percentage	LSI Variable	Percentage	LSI Variable	Percentage
1	Intake Not Required	69.1	Intake Not Required	72.6	Learning With Adults	82.6
2	Learning With Adults	56.2	Learning With Adults	52.4	Intake Not Required	82.6
3	Low Persistence	53.4	Low Persistence	47.1	Morning Best	65.2
4	Visual Preferences	46.6	Auditory Preferences	41.7	Low Persistence	47.8
5	Needs Structure	40.4	Needs Structure	39.3	Learning Several Ways	43.5
6	Late Morning Best	39.9	Tactile Preferences	35.7	Visual Preferences	43.5
7	Auditory Preferences	39.3	Morning Best	36.9	Afternoon Best	43.5
8	Late Morning Not Best	37.6	Late Morning Not Best	35.7	Late Morning Best	39.1
9	Morning Best	35.4	Peer Oriented Learner	34.5	Low Responsibility	34.8
10	Peer Oriented Learner	33.7	Learning Several Ways	34.5	Prefers Learning Alone	30.4
11	Learning Several Ways	32.6	Late Morning Best	34.5	Auditory Preferences	30.4
12	Not Adult-Motivated	30.3	Warm Temperature	32.7	Tactile Preferences	30.4

categories.

Students who had low attendance were characterized by several learning style variables. Low attenders were most characterized by their very high preferences for learning with adults and for not requiring intake as they studied. Low attenders tended to be least peer oriented and to prefer learning alone. They preferred a cool temperature, had the lowest high responsibility preferences, least needed structure, had the highest preference for learning in several ways, and had the highest preference for learning in the morning. They least preferred auditory methods.

Students who had medium school attendance appeared to have special needs and preferences. They tended to prefer low light and a cool temperature as they studied. They were the most not self-motivated, least not adult-motivated, but most not teacher-motivated. They were highly peer-oriented and had a high preference for working with adults. They had the highest preferences for auditory and tactile methods, and the lowest preference for visual methods. They most disliked kinesthetic methods. Medium attenders least preferred learning in the afternoon.

Students who had a high rate of school attendance had several learning style characteristics. They had the highest preference for bright light. They were most not adult-motivated and least not teacher-motivated. They had a tendency not to prefer learning alone; they were highly peer-oriented and had a high preference for working with adults. High attenders had the highest preferences for high responsibility and structure, although they had

the lowest preference for learning in several ways; they had the highest preference for visual methods. They had the highest preference for learning in the evening, although they more preferred learning in the morning and the late afternoon.

Summary

The findings reached from this review and analysis of data are presented.

1. The Learning Style Inventory was administered to 422 students.

2. The number of students whose results were considered for further study was 285.

3. Of the students whose results were considered for further study, 31.2 percent were from School A, 29.8 percent were from School B, and 38.9 percent were from School C.

4. There was no significant difference between the number of male and female students whose results were considered for further study.

5. Of the students whose results were considered for further study, 49.1 percent were in the elementary grade category, 31.9 percent were in the junior high grade category, and 19 percent were in the senior high grade category.

6. Of the students whose results were considered for further study, 30.5 percent were in the excellent academic achievement category, 49.1 percent were in the average academic

achievement category, and 20.4 percent were in the below average academic achievement category.

7. Of the students whose results were considered for further study, 62.5 percent were in the high attendance category, 29.5 percent were in the medium attendance category, and 8.0 percent were in the low attendance category.

8. Eighteen variables of learning style were sufficiently prevalent to be important for education practise for the students in the study. No variables of learning style were preferred by 100 percent of the students.

9. Significant differences in student preferences were found in 20 areas of learning style among the School A, School B and School C students. There were also differences in the rank order of preferences among the schools.

10. Significant differences between male and female students in preferences for variables of learning style were found in 10 learning style areas. There were also differences in the rank order of the preferences between male and female students.

11. Significant differences in student preferences among the elementary, junior high and senior high grade categories were found in 21 learning style areas. There were also differences in the rank order of the preferences among the students in the three grade categories.

12. Significant differences in student preferences among the excellent achievement, average achievement, and below-average

achievement categories were found in 17 learning style areas. There were also differences in the rank order of the preferences among the students in the three academic achievement categories.

13. Significant differences in student preferences among the high attendance, medium attendance and low attendance categories were found in 23 learning style areas. There were also differences in the rank order of the preferences among students in the three school attendance categories.

CHAPTER V

CONCLUSION

The conclusion to this study includes a statement of the study problem, conclusions drawn from this study and discussion of findings, implications for educational practise, suggestions for further research, and a summary of the study.

The Study Problem Restated

This study identified, through the use of the Learning Style Inventory, learning style variables that were existent among grades four through ten students attending school in selected isolated communities of Northeastern Manitoba. In addition, an attempt will be made to discuss the importance of the learning styles identified to prevailing educational practise and to discuss these implications generally.

Conclusions and Discussion of Findings

The purpose of this section is to summarize responses, to answer the six questions asked in this study and to discuss these findings.

Question 1

Are any variables of learning style sufficiently prevalent to be important for educational practise for the study population?

Conclusions to Question 1

Eighteen learning style variables were found to be preferred by at least 25 percent of the students in the study sample. These variables were deemed to be important for educational practise for the study population. There were, however, students who expressed a preference not to work in the variables of learning style identified in this study while they studied. The 18 variables of learning style identified in this study may be important for educational practise for most students in the study population but not necessarily for the entire study population.

Discussion of Question 1 Findings

This writer was somewhat surprised with the results. It was expected, from the literature review and from the writer's personal experience, that the students would have high levels of preference for the learning style variables of visual and tactile preferences, learning alone, informal design, structure not preferred, peer orientation and independence of adults. The findings were somewhat different from the expectations.

The finding that student preferences for auditory methods of presentation were about equal to student preferences for visual methods of presentation was initially one of the most surprising

results. Traditionally, however, oral methods of teaching children were used extensively by many Indian cultural groups and may continue to be used extensively at present with this student population. It was also found that auditory preferences increased and visual preferences decreased as grade level increased, and that students who attended school regularly had a 9 percent greater preference for auditory methods than did students who attended school less than 60 percent of the time. It may thus be that students have adjusted their learning style to match that of the school teaching style which depends to a large extent on auditory methods of presentation. It may also be that the students concerned in this study had a different cultural learning style than that described in the literature review. It may also be that the Learning Style Inventory does not address the same concerns in visual and auditory preferences as did the reports previously cited in this study. The students in this study expressed a preference for learning in several ways which included visual, auditory and tactile methods of presentation; they did have visual preferences, but they also had preferences for learning in other ways.

Student preferences for formal design, need for structure, for learning with adults, and to some extent for not requiring intake point to different learning style than that expected. Students did not prefer to learn alone but with their peers and, more often than not, with adults. The preferences for low persistence and low responsibility appear to be related to the needs for structure and formal setting. Dunn, Dunn and Price (1981)

suggested that students who have a preference for structure be given very precise assignments with no options, that students who have a preference for low responsibility be given short-term limited assignments with few options, and that students who have a preference for low persistence be given short-term limited assignments with frequent teacher reinforcement. It appears that the majority of students in this study would learn better were they given precise short-term assignments with a great deal of adult, but not necessarily teacher, reinforcement. Such a method of teaching would probably assist the students in this study who were ambivalent in the area of self-motivation, where again Dunn, Dunn and Price (1981) suggested that students be given short-term assignments with frequent discussion with teachers and, in a case such as this, with other adults or with peers. It also appears that students recognize that they would learn better in a formal setting in which they could more readily focus their attention on their studies.

It is important to recognize that there are students in this study who did not have any preference for the learning styles and teaching methods described, and that teaching methods must be adjusted to accommodate the learning styles of these students.

Identification of learning styles in this study was confined to learning style areas identified by the Learning Style Inventory. The ability to use memory skills, the importance of the oral tradition, respect for elders and tradition, and the absence of any measure of the attributes of cooperation and sharing, although these may be important attributes of the learning style of these children,

were not within the range of this study.

Question 2

Are there learning style differences among the three sample schools in this study?

Conclusions to Question 2

There were significant differences in learning style preferences among students attending School A, School B, and School C. Significant differences were found in 20 areas of learning style.

Discussion of Question 2 Findings

As the students in the three study sample schools are culturally uniform to a large extent, the writer did not expect to find large variations in learning style among students attending the three study sample schools. The cause of the differences is not known. It may be that culture has less of an effect on learning style than the writer was lead to expect as a result of the literature review for this study. It may be that the culture of the students in this study allows for greater diversity in learning style than is generally thought. The differences found in learning style among the study sample schools certainly demonstrate that the delimitation noted in this study must be seriously considered in any attempt to generalize the findings described in Chapter IV to other Cree-speaking students. The conclusion regarding the differences

found among students attending different schools indicates that attention be directed towards the learning styles of specific groups of students rather than towards all students in general.

Question 3

Are there learning style differences between male and female students?

Conclusion to Question 3

There were significant differences in learning styles between male and female students. Significant differences in learning were found in 10 learning style areas.

Discussion of Question 3 Findings

The writer expected that there would be learning style differences between male and female students. Price, Dunn and Dunn (1977) had indicated that learning style differences existed between male and female students. There was difficulty in relating these differences with the study as Dunn, Dunn and Price addressed different concerns. The findings that female students had a higher degree of auditory preferences than did male students and that male students had a higher degree of visual preferences than did female students were expected. Similarly, the findings that male students had a higher preference for low persistence and low responsibility in their learning styles than did female students were also expected.

Male students required more formality in their learning environment. They expressed a higher preference for formal design and structure and a lower preference for needing mobility than did female students. These findings, together with the findings that male students had a higher preference for low persistence and low responsibility, appear to indicate that male students have a higher preference to be taught through the teaching methods described in "Discussion of Question 1 Findings." Female students appear to have a higher preference for a less formal environment and less structure in their studies.

Question 4

Are there learning style differences among elementary grade students, junior high students, and senior high students?

Conclusion to Question 4

There were significant differences in learning styles among elementary grade students, junior high students, and senior high students. Significant differences were found in 21 learning style areas among students in the three grade categories.

Discussion of Question 4 Findings

The writer expected that there would be learning style differences among elementary grade students, junior high students, and senior high students. Dunn, Dunn and Price (1981) had indicated that such differences were to be expected.

Agreement in findings between this study and research by Dunn, Dunn and Price (1981), previously cited in this study, was found in several learning style preferences. These are:

1. Less formal design was preferred as grade increased;
2. Learning with adults was less preferred as grade increased;
3. Learning through several ways decreased as grade increased;
4. Learning auditorially increased as grade increased;
5. Visual preferences decreased as grade increased;
6. Tactile preferences decreased as grade increased; and
7. More intake was preferred as grade increased.

There was no agreement in 12 other learning style preferences between the findings of this study and the previously cited research by Dunn, Dunn and Price (1981).

The research findings in this study indicate that learning styles change as children grow older. This change was recognized in the second limitation to this study, that this study only tested the student's perception of his/her learning style at a particular time. They also indicate that there would be probable change in learning styles of the students at various grade levels were this study repeated with a similar group of children.

A few trends which are of importance to the education of the students in this study are noted. The first trend is that the students in this study have indicated that they become more independent as they grow older. Student preferences for working

with peers and adults decreases to a very great extent and preference for working alone increases as students grow older. Senior high students had a 50 percent preference to be independent of adults as they studied while 67.1 percent of elementary students preferred to learn with adults; and 42.9 percent of elementary students were peer oriented while only 18.1 percent of senior high students were peer oriented. The second trend noted is the change from learning through several ways, especially through visual and tactile methods, to a more exclusively auditory orientation as students reach the senior high level. The third trend noted is that junior high students had the highest preference for a formal setting in their studies and that both junior high and senior high students had a much higher preference for a formal setting than did elementary grade students.

Question 5

Are there learning style differences among students whose academic achievement is excellent, students whose academic achievement is average, and students whose academic achievement is below-average?

Conclusion to Question 5

There were significant differences in learning style among students whose academic achievement is excellent, students whose academic achievement is average, and students whose academic achievement is below-average. Significant differences were found in

17 learning style areas among students in the three academic achievement categories.

Discussion of Question 5 Findings

The writer expected that there would be differences in learning style among excellent, average, and below-average academic achievement students. Dunn, Dunn and Price (1981) and Marcus (1979) had indicated that learning style differences would be found.

There is a high degree of positive relationship between the findings in this study and the previously cited research by Dunn, Dunn and Price (1981). Positive relationship between the learning style variables of excellent achieving students in this study and learning style variables of high reading and mathematics achieving students as reported by Dunn, Dunn and Price (1981) were found in these variables--highest preference for high persistence and high responsibility, did not function best in late morning, preferred formal design, and worked independently of adults. Dunn, Dunn and Price (1981) indicated that high achieving students were highly self-motivated and did not prefer bright light. These variables, however, did not describe excellent achieving students in this study. Similarly, there was a positive relationship between the learning style variables which described below-average students in this study and low mathematics and reading achieving students as reported by Dunn, Dunn and Price (1981), although not to the same extent as between high and excellent achieving students. Seven variables of learning style were found to be the same while four

variables which described the learning style of low achieving students in the study reported by Dunn, Dunn and Price (1981) could not be used to describe the learning style of below-average students in the study. It may be that excellent students in this study and high achieving students as reported by Dunn, Dunn and Price (1981) include students in the same achievement range while the below-average students in this study could be in a different achievement range than the low achieving students in the study reported by Dunn, Dunn and Price (1981).

The relationship between the learning style variables which described students in this study and the learning style variables that described students in the study cited by Marcus (1979) could not be clearly defined; six variables of learning style were the same and six variables of learning style were different for below-average students in both studies. In addition, other variables described the learning style of students in this study which did not describe those of the Marcus (1979) study. For example, Marcus (1979) reported that below-average students were less auditory and visual, and more tactile than average and above average students, while in this study, below-average students were the most auditory and average students were the most visually oriented. There were no significant differences in tactile preferences among the three groups in this study. It must be noted, however, that Marcus (1979) studied the learning styles of grade seven students only while this study studied the learning style of students from grade four through grade ten. As learning styles vary

with grade levels, the differences found in learning style between these two studies could possibly be explained by these changes. The data, as presented in this study, do not allow the writer, however, to make that conclusion.

Although there were similarities in the learning styles of students in the various academic achievement levels between this study and the studies cited, there were also differences. The reason for the differences is a matter for conjecture. Nonetheless, the existence of differences strengthens Marcus' (1979) observation that no areas of learning style were characteristic of all students within any ability group. The writer concurs with Marcus' (1979) suggestion that each student be treated as an individual and be taught through his/her preferred learning style.

The writer also concurs with the suggestion by Dunn, Dunn and Price (1981) that general classroom teaching strategies tend to match the learning styles of high achieving students rather than those of average and below-average students.

It appears that there are two areas of concern for teaching students of various academic achievement categories. The first is that students of different achievement levels tend to have different learning styles, and the second is that there are individual variations within the learning style variables which describe the learning style of students within any academic achievement category.

Question 6

Are there learning style differences among students whose school attendance is high, students whose school attendance is medium, and students whose school attendance is low?

Conclusion to Question 6

There were significant differences in learning styles among students whose school attendance is high, students whose school attendance is medium, and students whose school attendance is low. Significant differences were found in 23 areas of learning style among the students in the three school attendance categories.

Discussion of Question 6 Findings

The extent of differences in learning styles among students in the three school attendance categories was the most surprising finding of this study to the writer. The reasons for low school attendance are varied, but centre on difficulties with student transportation service during spring "break-up" and fall "freeze-up," on traditional spring and fall trapping activities, and on the reluctance of some parents to have their children attend school regularly. It also appears possible that the inability or the unwillingness of the school system to accommodate the learning styles of medium and low school attendance students may be another reason for their poor school attendance. This observation appears to be in agreement with the suggestion by Dunn and Dunn (1979 a) that students are adversely affected when their learning styles are

not being met by the school.

As indicated previously in this study, attendance at school is one of the major concerns in providing for the education of the students concerned. It is apparent that attention should be directed towards accommodating the learning styles of medium and low attenders. Particular attention should be given to the unusually high preference of low school attendance students for learning with adults. The writer's observation from personal experience is that low school attendance students become high school attendance students where these students are given a great deal of teacher attention.

It is important to note that the results of only 23 students were considered in the low school attendance category and that children who were non-school attenders were not considered in this study. It is possible that the learning style of low school attendance students could have different characteristics were a larger group of low school attendance students used.

Summary of Conclusions

The conclusions to this study are:

1. Eighteen variables of learning style were found to be sufficiently prevalent to be important for educational practise for the study population;
2. There were significant learning style differences among students attending the three schools in the study sample;

3. There were significant learning style differences between male and female students;
4. There were significant learning style differences among elementary grade students, junior high students, and senior high students;
5. There were significant learning style differences among students whose academic achievement was excellent, students whose academic achievement was average, and students whose academic achievement was below-average; and
6. There were significant learning style differences among students whose school attendance was high, students whose school attendance was medium, and students whose school attendance was low.

Implications for Educational Practise

The following implications for educational practise were drawn from this study:

1. The attention of educators is directed towards the existence of learning style differences between male and female students, among students at different grade levels, among students from different academic achievement levels, and among students who have different rates of school attendance. The existence of differences in learning styles necessitates the use of different teaching styles in order to accommodate these differences.

2. As discussed in the literature review, a "computer dating" approach is impractical in matching teaching and learning styles. Teachers will require training in order that they be better able to accommodate a variety of learning styles within the classroom.

3. More research on specific learning styles of students in the various categories described in this study will have to be undertaken in order that learning style characteristics be defined with a greater degree of precision.

4. Even though learning style trends were found, it is important to note that there are individual differences in learning styles. Educators must recognize that such variations exist and accommodate individual learning styles in their teaching methods.

5. Specific attention must be directed towards the learning styles of below-average achievement students and low school attendance students as these appear to be the students whose educational needs are least met by present teaching methods.

6. Educators must note that learning styles do not appear to be permanent student characteristics and that learning styles appear to change as students grow older. Students should not be permanently labelled with any specific learning style characteristics.

7. Teacher training institutions should recognize the importance of learning styles and provide training on the application of learning styles within the classroom.

Suggestions for Further Research

The following suggestions further research are made:

1. Below-average achievement students and low school attendance students appear to have learning styles which vary greatly with school teaching styles. Further research of their specific learning styles should be undertaken in order to define their learning styles more precisely. This will assist teachers in accommodating these specific learning styles.

2. The learning style of non-school attenders and students who have dropped out of school should be studied in order to determine whether part of the explanation for non-school attendance and dropping out includes learning styles which are not accommodated within the school teaching styles. Teaching methods could then be adjusted to accommodate any specific learning style differences, should such differences exist.

3. It was noted that a large number of elementary student results were not included in this study because the consistency score was less than 70 percent. As junior high and senior high had results with a much higher rate of consistency, it may be that elementary students did not have sufficient reading and comprehension skills to answer the Learning Style Inventory with a higher degree of consistency. This study should be replicated with elementary level students with specific instruction that the administrators read the questions aloud to the students.

4. The learning styles of grade 1, 2, and 3 students and grade 11 and 12 students should be determined.

5. A comparison of teacher perceptions of student learning styles with actual student learning styles should be undertaken in order to determine the accuracy of teacher perceptions of student learning styles.

6. A study of learning styles of seventh grade students should be undertaken in order that results be compared with the Marcus (1979) study. This may be of assistance in explaining the present difficulty noted in comparing the results of this study and the Marcus (1979) study.

Summary of the Study

The Learning Style Inventory (1978 edition) by Dunn, Dunn and Price was used to identify variables of learning style that were existent among Cree-speaking students attending school in selected isolated Northeastern Manitoba communities.

The study population consisted of 1111 Cree-speaking students in grades four through ten in seven schools while the study sample consisted of the grades four to ten students attending three randomly selected schools and who were present during test administration.

The Learning Style Inventory was administered to 422 students in April, 1980. The student answer sheets were computer scored by Price Systems Inc. and the student data were analyzed in response to the six questions asked in the study. The raw score data were converted to percentages and tabled. Tables of rank order of

significant differences among the various categories were also made in response to the six questions asked.

The results indicated that there were 18 learning style variables which were defined as being educationally important for the study population. No learning style variables, however, were preferred by 100 percent of the students. Significant differences were found as follows: among students in the three sample schools; between male and female students; among elementary, junior high, and senior high students; among excellent, average, and below-average academic achievement students; and among students with high, medium, and low rates of school attendance.

Suggestions for educational practise for the student population were made which noted the importance of group learning style trends and individual learning styles. The findings were discussed and implications for educational practise were drawn. Seven suggestions for further research were made as a result of this study.

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APPENDICES

APPENDIX A

Related Letters

Oxford House School
Oxford House, Manitoba
R0B 1C0
May 28, 1979

Mr. M. Kohut
District Supt. of Education
Island Lake District
Indian and Northern Affairs
1100 - 275 Portage Avenue
Winnipeg, Manitoba
R3B 3A3

Dear Mr. Kohut:

I am presently completing requirements for the degree of Master of Education. I have chosen to study the learning styles of students enrolled in grades four through ten in several schools in Northeastern Manitoba.

This study requires that the Learning Style Inventory be administered to students attending several schools administered by the Department of Indian Affairs. Test administration will require approximately thirty minutes. To facilitate test administration, I will require a few days leave to allow me to travel to the schools involved in the study to meet the teachers who will administer the test in order to discuss administration procedures and to collect the necessary data. I will also require information on student attendance and academic achievement which I hope to obtain from the student cumulative records.

I request permission to administer the Learning Style Inventory to the students in the schools selected for the study, to obtain information on their attendance and academic achievement, and to take three days leave to allow for data collection and test administration.

Yours truly,

Leonard Mariash

Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

1100 - 275 Portage Avenue
Winnipeg, Manitoba R3B 3A3
June 9, 1979

L. Mariash
Principal
Oxford House School

Your file / Votre référence

Our file / Notre référence 501/2-1(IL1)

I hereby acknowledge receipt of your letter of May 28 and confirmation of our telephone conversation of June 6 requesting for leave to pursue the administration of a test regarding your studies towards your masters degree program. This letter is to confirm my verbal approval to commence work towards your thesis. In reviewing and examining the process which you will be taking in writing up your thesis, the findings should be interesting and beneficial not only to you as the writer of the thesis and to your associated faculty and institution the University of Manitoba but also the children and the staff which will no doubt enhance the future quality of education and improve the quality of life.

Your thesis has my full support and my full co-operation. I know that pieces of work of this nature are no doubt a lot of work and take a lot of time. I wish you success.

Yours truly,

M. Kohut
District Supt. of Education
Island Lake District

Canada

Garden Hill School
Island Lake, Manitoba
Canada ROB 0T0
June 1, 1983

Dr. Gary E. Price
President, Price Systems Inc.
Box 3067
Lawrence, Kansas
66044

Dear Dr. Price:

I am presently completing work on a Master of Education thesis titled " Identification of Learning Styles Prevalent Among Grades Four Through Ten Students Attending School in Selected Isolated Northeastern Manitoba Communities." I am associated with the University of Manitoba and am presently principal of Garden Hill School.

The Learning Style Inventory (1978 edition) was administered to 488 students attending school in Northeastern Manitoba. The LSI answer sheets were forwarded to Price Systems Inc. in December, 1981, where they were scored. These results provided the basic data for my study.

The published literature by Dr. Rita Dunn, Dr. Kenneth Dunn and Dr. Gary Price was referred to extensively in the literature review section of the thesis.

I find that the suggestions for teacher adaptation of the learning environment are particularly adaptable to this thesis. I would like to include these suggestions in an appendix to my thesis. Specifically, I request permission to include pages 4,5, 6,7,8,9,10, and 11 from LSI Manual (1981) by Rita Dunn, Kenneth Dunn and Gary E. Price in Appendix E of the Master of Education thesis titled " Identification of Learning Styles Prevalent Among Grades Four Through Ten Students Attending School in Selected Isolated Northeastern Manitoba Communities."

I will be very happy to provide additional information on request.

Yours truly,

Leonard Mariash
Principal

Box 3067
Lawrence,KS 66044
June 8, 1983

Mr. Leonard Mariash, Principal
Garden Hill School
Island Lake,Manitoba
Canada R0B 0T0

Dear Mr. Mariash:

We appreciate your work with the Learning Style Inventory.

I am happy to give you permission to include pages 4,5,6,7,8,9,10, and 11 from the 1981 edition of the LSI manual to be used in Appendix E for your Master of Education thesis titled "Identification of the Learning Styles Prevalent Among Grades Four Through Ten Students Attending School in Selected Isolated Northeastern Manitoba Communities."

I like to keep current with all the research being done on the LSI and I would appreciate it very much if you would send me a copy of your masters thesis.

If you have additional questions please let me know. Best of luck with your research.

Sincerely,

Gary E. Price

Gary E. Price, Ph.D.
President, Price Systems,Inc.

APPENDIX B

Learning Style Inventory Test Materials

LEARNING STYLE INVENTORY

by

Rita Dunn, Ed.D.

Kenneth Dunn, Ed.D.

Gary E. Price, Ph.D.

Directions

This inventory has several statements about how people like to learn. Read each statement and decide whether you usually would agree with that statement or whether you usually would disagree with that statement. If you agree, answer "true" to that statement and if you disagree, answer "false" to that statement.

You should give your immediate or first reaction to each question. Please answer each question on the separate answer sheet. Do not write on this booklet.

Before you begin to answer the questions, be certain to write your name, your sex, your grade and the other information called for in the space provided on the answer sheet.

Remember, try to answer every question.

Now open the booklet and start with question 1.

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P. O. Box 3271, Lawrence, Kansas 66044

1. I study best when it is quiet.
2. My parents want me to get good grades.
3. I like studying with lots of light.
4. I like to be told exactly what to do.
5. I concentrate best when I feel warm.
6. I study best at a table or desk.
7. When I study I like to sit on a soft chair or couch.
8. I like to study with one or two friends.
9. I like to do well in school.
10. I usually feel more comfortable in warm weather than I do in cool weather.
11. Things outside of school are more important to me than my school work.
12. I am able to study best in the morning.
13. I often have trouble finishing everything I ought to do.
14. I have to be reminded often to do something!
15. I like making my teacher proud of me.
16. I study best when the lights are dim.
17. When I really have a lot of studying to do I like to work alone.
18. I do not eat or drink, or chew while I study.
19. I like to sit on a hard chair when I study.
20. Sometimes I like to study alone and sometimes with friends.
21. The things I remember best are the things I read.
22. I think better when I eat while I study.
23. I like others to outline how I should do my school work.
24. I often nibble something as I study.
25. It' s hard for me to sit in one place for a long time.
26. I remember things best when I study them early in the morning.
27. I really like people to talk to me.
28. I hardly ever finish all my work.
29. I usually start my homework in the afternoon.
30. There are many things I like doing better than going to school.
31. I like to feel inside what I learn.
32. Sound usually keeps me from concentrating.
33. If I have to learn something new, I like to learn about it by having it told to me.
34. At home I usually study under a shaded lamp while the rest of the room is dim.
35. I really like to do experiments.
36. I usually feel more comfortable in cool weather than I do in warm weather.
37. When I do well in school, grown-ups in my family are proud of me.
38. It is hard for me to do my school work.
39. I concentrate best when I feel cool.
40. I like to sit on carpeting or rugs when I study.
41. I think my teacher feels good when I do well in school.
42. I remember to do what I am told.
43. I really like to watch television.
44. I can block out sound when I work.
45. I am happy when I get good grades.
46. I like to learn most by building, baking or doing things.
47. I usually finish my homework.

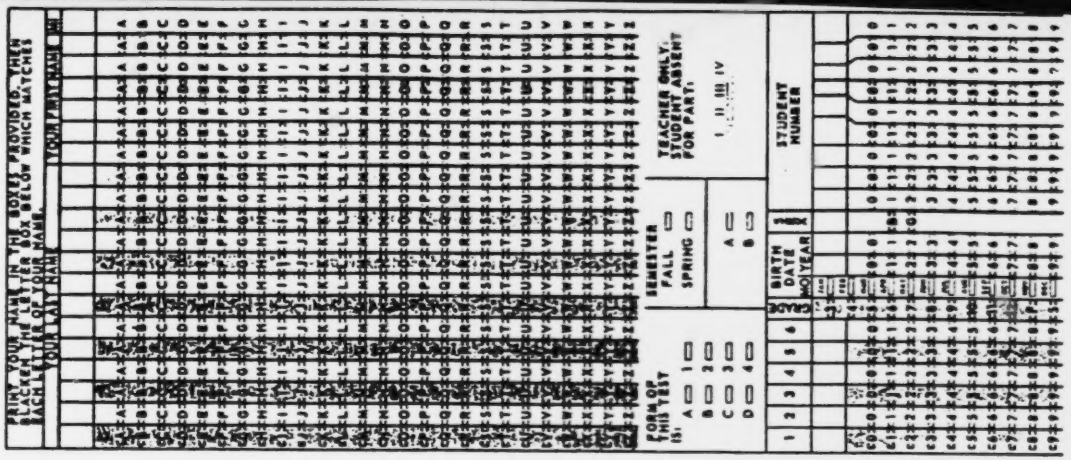
GO ON TO NEXT PAGE

48. If I could go to school anytime during the day, I would choose to go in the early morning.
49. I have to be reminded often to do something.
50. It is hard for me to get things done just before lunch.
51. It is easy for me to remember what I learn when I feel it inside of me.
52. I like to be told exactly what to do.
53. My parents are interested in how I do in school.
54. I like my teacher to check my school work.
55. I enjoy learning by going places.
56. When I really have a lot of studying to do I like to work alone.
57. I like adults nearby when I work alone or with a friend.
58. I can sit in one place for a long time.
59. I cannot get interested in my school work.
60. I really like to draw, color, or trace things.
61. The things I remember best are the things I hear.
62. I remember things best when I study them in the afternoon.
63. No one really cares if I do well in school.
64. I really like to shape things with my hands.
65. When I study I put on many lights.
66. I like to eat or drink, or chew while I study.
67. When I really have a lot of studying to do I like to work with a group of friends.
68. When it' s warm outside I like to go out.
69. I remember things best when I study them early in the morning.
70. I can sit in one place for a long time.
71. I often forget to do or finish my homework.
72. I like to make things as I learn.
73. I can think best in the evening.
74. I like exact directions before I begin a task.
75. I think best just before lunch.
76. The things I like doing best in school I do with friends.
77. I like adults nearby when I study.
78. My family wants me to get good grades.
79. Late morning is the best time for me to study.
80. I like to learn most by building, baking or doing things.
81. I often get tired of doing things and want to start something new.
82. I keep forgetting to do the things I' ve been told to do.
83. I like to be able to move and experience the motion and the feel of what I study.
84. When I really have a lot of studying to do I like to work with two friends.
85. I like to learn through real experiences.
86. If I could go to school anytime during the day, I would choose to go in the early morning.
87. The thing I like doing best in school, I do with a grown-up.
88. I can ignore most sound when I study.
89. If I have to learn something new, I like to learn about it by seeing a filmstrip or film.
90. I study best near lunchtime.
91. I like school most of the time.

GO ON TO NEXT PAGE

92. I really like to listen to people talk.
93. I often eat something while I study.
94. I enjoy being with friends when I study.
95. It' s hard for me to sit in one place for a long time.
96. I remember things best when I study them before evening.
97. I think my teacher wants me to get good grades.
98. The thing I like doing best in school I do with grown-ups.
99. I really like to build things.
100. I can study best in the afternoon.
101. Sound bothers me when I am studying.
102. When I really have a lot of studying to do I like to work with two friends.
103. When I can, I do my homework in the afternoon.
104. I love to learn new things.

STOP



SCHOOL _____ CITY _____

INSTRUCTOR _____ GRADE _____ TEST _____

I

1	6	11	16	21	26	31	36	41	46	51	56	61	66	71	76
2	7	12	17	22	27	32	37	42	47	52	57	62	67	72	77
3	8	13	18	23	28	33	38	43	48	53	58	63	68	73	78
4	9	14	19	24	29	34	39	44	49	54	59	64	69	74	79
5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80

II

81	86	91	96	101	106	111	116	121	126	131	136	141	146	151	156
82	87	92	97	102	107	112	117	122	127	132	137	142	147	152	157
83	88	93	98	103	108	113	118	123	128	133	138	143	148	153	158
84	89	94	99	104	109	114	119	124	129	134	139	144	149	154	159
85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160

III

161	166	171	176	181	186	191	196	201	206	211	216	221	226	231	236
162	167	172	177	182	187	192	197	202	207	212	217	222	227	232	237
163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238
164	169	174	179	184	189	194	199	204	209	214	219	224	229	234	239
165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240

IV

241	246	251	256	261	266	271	276	281	286	291	296	301	306	311	316
242	247	252	257	262	267	272	277	282	287	292	297	302	307	312	317
243	248	253	258	263	268	273	278	283	288	293	298	303	308	313	318
244	249	254	259	264	269	274	279	284	289	294	299	304	309	314	319
245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320

STANDARD ANSWER SHEET

PRINTED IN U.S.A. DS 1150

Learning Style Inventory
Dunn, Dunn and Price
Answer Sheet

Name _____ No._____ Sex M F Grade _____

Teacher _____ School _____ No. _____

Circle T for "True" and F for "False".

1. T F	27. T F	53. T F	79. T F
2. T F	28. T F	54. T F	80. T F
3. T F	29. T F	55. T F	81. T F
4. T F	30. T F	56. T F	82. T F
5. T F	31. T F	57. T F	83. T F
6. T F	32. T F	58. T F	84. T F
7. T F	33. T F	59. T F	85. T F
8. T F	34. T F	60. T F	86. T F
9. T F	35. T F	61. T F	87. T F
10. T F	36. T F	62. T F	88. T F
11. T F	37. T F	63. T F	89. T F
12. T F	38. T F	64. T F	90. T F
13. T F	39. T F	65. T F	91. T F
14. T F	40. T F	66. T F	92. T F
15. T F	41. T F	67. T F	93. T F
16. T F	42. T F	68. T F	94. T F
17. T F	43. T F	69. T F	95. T F
18. T F	44. T F	70. T F	96. T F
19. T F	45. T F	71. T F	97. T F
20. T F	46. T F	72. T F	98. T F
21. T F	47. T F	73. T F	99. T F
22. T F	48. T F	74. T F	100. T F
23. T F	49. T F	75. T F	101. T F
24. T F	50. T F	76. T F	102. T F
25. T F	51. T F	77. T F	103. T F
26. T F	52. T F	78. T F	104. T F

APPENDIX C

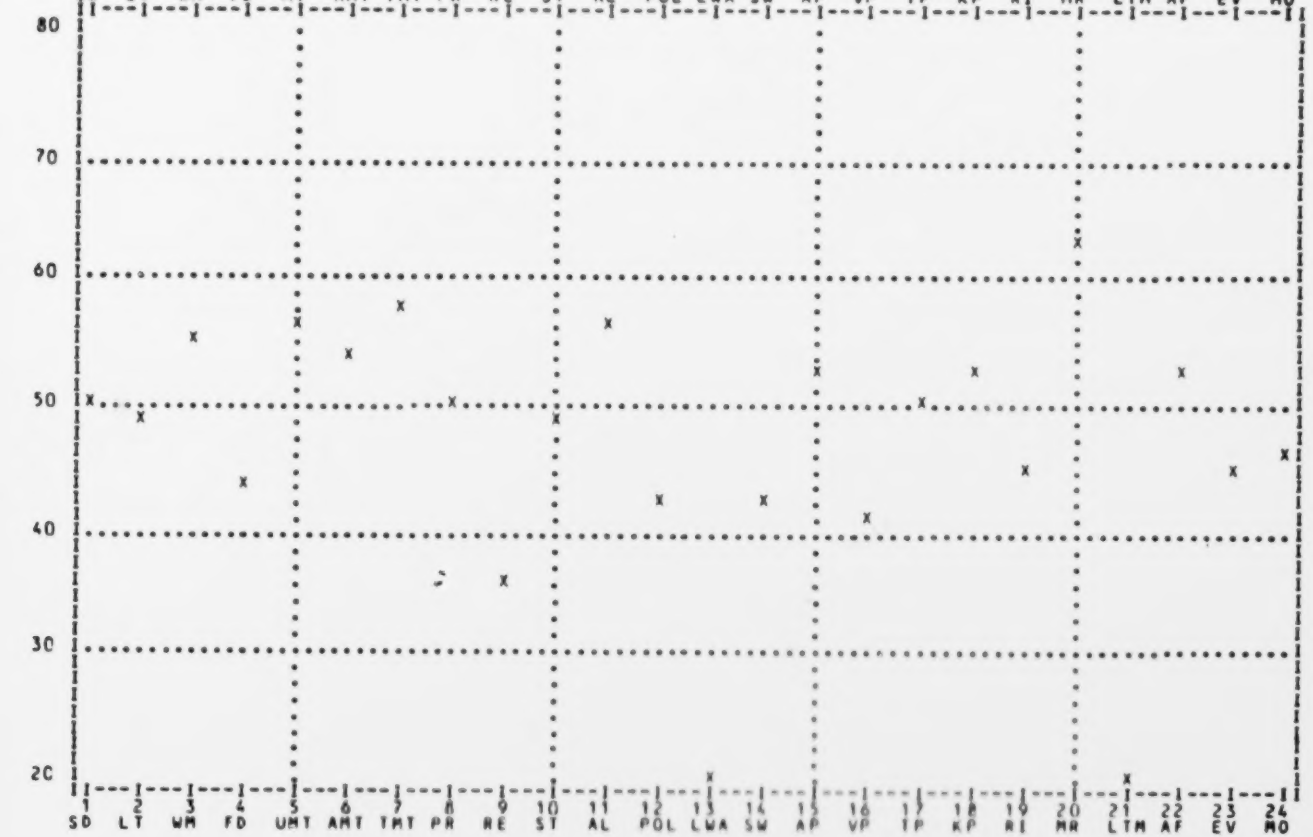
Sample Scoring Options

LEARNING STYLE INVENTORY-INDIVIDUAL SUMMARY DUNN, DUNN AND PRICE

NAME: GROUP: IDENTIFICATION: SEX: GRADE: CONSISTENCY: CLASS NO: 27 DATE: 12/23/81

1.00 SCHOOL NO:

	1 SD	2 LT	3 WM	4 FD	5 MT	6 AMT	7 TMT	8 PR	9 RE	10 ST	11 AL	12 POL	13 LWA	14 SW	15 AP	16 VP	17 TP	18 KP	19 RI	20 MR	21 LTM	22 AF	23 EV	24 MO
SCORE RAW	2	2	4	1	5	4	4	3	1	2	6	1	0	1	3	1	4	5	2	4	0	3	1	2
STD	50	49	55	44	57	53	57	50	36	49	56	43	0	43	53	41	49	53	45	63	0	52	45	46



1 SD 2 LT 3 WM 4 FD 5 MT 6 AMT 7 TMT 8 PR 9 RE 10 ST 11 AL 12 POL 13 LWA 14 SW 15 AP 16 VP 17 TP 18 KP 19 RI 20 MR 21 LTM 22 AF 23 EV 24 MO

LEARNING STYLE SUMMARY FOR STUDENTS HAVING STANDARD SCORE GREATER THAN 60
DUNN, DUNN AND PRICE

GROUP IDENTIFICATION:

12/23/81

STUDENT	CONS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	1.00																				•				
	0.75				•										•	•		•				•			
	0.88				•									•								•			
	0.38	•			•									•							•	•			
	0.88												•	•	•						•	•	•		
	1.00										•		•	•	•	•	•	•			•	•	•		
	0.50				•								•	•									•		
	0.63		•	•													•								
	0.75		•											•	•										
	0.50												•									•			
	0.75													•	•						•	•			
	0.88										•			•	•	•	•	•				•			
	0.25																								
	0.75		•	•										•		•									
	0.75				•				•				•				•								
	0.88		•	•	•				•	•	•	•				•	•								
	1.00		•	•	•				•	•	•						•			•	•	•			
	0.88													•	•										

ING STYLE SUMMARY FOR STUDENTS HAVING STANDARD SCORE LESS THAN 40
DUNN, DUNN AND PRICE

DENTIFICATION: 12/23/81

CONS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1.00									*				*								*			
0.75								*	*				*						*				*	
0.88			*					*											*					
0.38								*		*									*				*	
0.88						*	*				*							*						
1.00						*		*	*		*													
0.50						*	*	*	*											*				
0.63	*							*					*					*	*		*	*		
0.75							*	*							*	*	*					*	*	
0.50						*		*									*	*	*					
0.75															*		*		*				*	
0.88								*	*										*					
0.25		*				*	*	*							*	*		*	*	*		*	*	*
0.75								*	*										*		*			
0.75											*								*		*	*		
0.88	*					*						*									*	*		
1.00	*												*	*										*
0.88	*						*	*								*			*		*	*		

TOTAL RESPONSES BY SUBSCALE FOR STANDARD SCORE LESS THAN 40
DUNN, DUNN AND PRICE

GROUP IDENTIFICATION: 12/23/81

LSI AREA	SUBSCALE	RESPONSES	PERCENTAGE
SOUND (SD)	1	4	22.22
LIGHT (LT)	2	1	5.56
WARMTH (WM)	3	1	5.56
FORMAL DESIGN (FD)	4	0	0.
SELF MOTIVATED (MT/UMT)	5	0	0.
ADULT MOTIVATED (AMT)	6	6	33.33
TEACHER MOTIVATED (TMT)	7	5	27.78
PERSISTANT (PR)	8	12	66.67
RESPONSIBLE (RE)	9	6	33.33
STRUCTURE (ST)	10	1	5.56
LEARNING ALONE (AL)	11	3	16.67
PEER ORIENTED LEARNER (POL)	12	1	5.56
LEARNING WITH ADULTS (LWA)	13	4	22.22
SEVERAL WAYS (SW)	14	1	5.56
AUDITORY PREFERENCES (AP)	15	3	16.67
VISUAL PREFERENCES (VP)	16	3	16.67
TACTILE PREFERENCES (TP)	17	3	16.67
KINESTHETIC PREFERENCES (KP)	18	4	22.22
REQUIRES INTAKE (RI)	19	11	61.11
MORNING (MR)	20	2	11.11
LATE MORNING (LTMR)	21	6	33.33
AFTERNOON (AF)	22	6	33.33
EVENING (EV)	23	5	27.78
NEEDS MOBILITY (MO)	24	2	11.11

TOTAL NUMBER OF STUDENTS: 18 TOTAL RESPONSES: 90

TOTAL RESPONSES BY SUBSCALE FOR STANDARD SCORE GREATER THAN 60
DUNN, DUNN AND PRICE

GROUP IDENTIFICATION: 12/23/81

LSI AREA	SUBSCALE	RESPONSES	PERCENTAGE
SOUND (SD)	1	1	5.56
LIGHT (LT)	2	5	27.78
WARMTH (WM)	3	4	22.22
FORMAL DESIGN (FD)	4	7	38.89
SELF MOTIVATED (MT/UMT)	5	0	0.
ADULT MOTIVATED (AMT)	6	0	0.
TEACHER MOTIVATED (TMT)	7	0	0.
PERSISTANT (PR)	8	3	16.67
RESPONSIBLE (RE)	9	2	11.11
STRUCTURE (ST)	10	4	22.22
LEARNING ALONE (AL)	11	1	5.56
PEER ORIENTED LEARNER (POL)	12	5	27.78
LEARNING WITH ADULTS (LWA)	13	10	55.56
SEVERAL WAYS (SW)	14	7	38.89
AUDITORY PREFERENCES (AP)	15	5	27.78
VISUAL PREFERENCES (VP)	16	5	27.78
TACTILE PREFERENCES (TP)	17	3	16.67
KINESTHETIC PREFERENCES (KP)	18	0	0.
REQUIRES INTAKE (RI)	19	1	5.56
MORNING (MR)	20	6	33.33
LATE MORNING (LTMR)	21	9	50.00
AFTERNOON (AF)	22	3	16.67
EVENING (EV)	23	0	0.
NEEDS MOBILITY (MO)	24	0	0.

TOTAL NUMBER OF STUDENTS: 18 TOTAL RESPONSES: 81

APPENDIX D

Frequency Tables--Number of Student Preferences

Table 1.

APPENDIX D

Total Number of Responses for Each LSI Variable

LSI Variable 60 or Higher	Total Number	LSI Variable 40 or Lower	Total Number
1. Sound Preferred	14	1. Quiet Preferred	36
2. Bright Light	67	2. Low Light	31
3. Warm Temperature	80	3. Cool Temperature	27
4. Formal Design	142	4. Informal Design	3
5. Self-Motivated	-	5. Not Self-Motivated	12
6. Adult-Motivated	-	6. Not Adult-Motivated	81
7. Teacher-Motivated	-	7. Not Teacher-Motivated	27
8. High Persistence	45	8. Low Persistence	147
9. High Responsibility	43	9. Low Responsibility	76
10. Needs Structure	115	10. Structure Not Preferred	7
11. Prefers Working Alone	53	11. Learning Alone Not Preferred	75
12. Peer Oriented Learner	94	12. Not Peer Oriented	45
13. Learning With Adults	163	13. Independent of Adults	76
14. Learning Several Ways	97	14. Several Ways Not Preferred	17
15. Auditory Preferences	112	15. No Auditory Preferences	20
16. Visual Preferences	125	16. No Visual Preferences	11
17. Tactile Preferences	88	17. No Tactile Preferences	28
18. Kinesthetic Preferences	-	18. No Kinesthetic Preferences	44
19. Intake Required	12	19. Intake Not Rrequired	203
20. Morning Best	109	20. Morning Not Best	33
21. Late Morning Best	109	21. Late Morning Not Best	102
22. Afternoon Best	66	22. Afternoon Not Best	67
23. Evening Best	17	23. Evening Not Best	19
24. Mobility Needed	9	24. Mobility Not Needed	63
Number of Students	285	Number of Students	285

Table II.

APPENDIX D

Comparison of Total Number of LSI Responses With Number of LSI Responses per School

LSI Variable 60 or Higher	Total	School A	School B	School C
1. Sound Preferred	14	7	2	5
2. Bright Light	67	21	24	22
3. Warm Temperature	80	21	26	33
4. Formal Design	142	37	32	73
5. Self-Motivated	-	-	-	-
6. Adult-Motivated	-	-	-	-
7. Teacher-Motivated	-	-	-	-
8. High Persistence	45	18	14	13
9. High Responsibility	43	19	12	12
10. Needs Structure	115	38	35	42
11. Prefers Working Alone	53	13	18	22
12. Peer Oriented Learner	94	32	23	39
13. Learning With Adults	163	59	41	63
14. Learning Several Ways	97	38	25	34
15. Auditory Preferences	112	35	26	51
16. Visual Preferences	125	39	35	51
17. Tactile Preferences	88	29	16	43
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	12	2	6	4
20. Morning Best	109	32	29	48
21. Late Morning Best	109	33	34	42
22. Afternoon Best	66	24	17	25
23. Evening Best	17	3	4	10
24. Mobility Needed	9	-	3	6
Number of Students	285	89	85	111

LSI Variable 40 or Lower	Total	School A	School B	School C
1. Quiet Preferred	36	8	13	15
2. Low Light	31	13	7	11
3. Cool Temperature	27	9	7	11
4. Informal Design	3	-	2	1
5. Not Self-Motivated	12	2	5	5
6. Not Adult-Motivated	81	20	30	31
7. Not Teacher-Motivated	27	9	11	7
8. Low Persistence	147	39	40	68
9. Low Responsibility	76	20	25	31
10. Structure Not Preferred	7	1	2	4
11. Learning Alone Not Preferred	75	26	19	30
12. Not Peer Oriented	45	12	14	19
13. Independent of Adults	76	18	26	32
14. Several Ways Not Preferred	17	5	5	7
15. No Auditory Preferences	20	6	9	5
16. No Visual Preferences	11	2	5	4
17. No Tactile Preferences	28	9	16	3
18. No Kinesthetic Preferences	44	9	18	17
19. Intake Not Required	203	69	50	84
20. Morning Not Best	33	10	8	15
21. Late Morning Not Best	102	33	30	39
22. Afternoon Not Best	67	18	23	26
23. Evening Not Best	19	8	7	4
24. Mobility Not Needed	63	11	26	26
Number of Students	285	89	85	111

Table III.

APPENDIX D

Comparison of Total Number of LSI Responses With Number of LSI Responses for Males and Females

LSI Variable 60 or Higher	Total	Sex M	Sex F
1. Sound Preferred	14	6	8
2. Bright Light	67	41	26
3. Warm Temperature	80	36	44
4. Formal Design	142	77	65
5. Self-Motivated	-	-	-
6. Adult-Motivated	-	-	-
7. Teacher-Motivated	-	-	-
8. High Persistence	45	24	21
9. High Responsibility	43	18	25
10. Needs Structure	115	62	53
11. Prefers Working Alone	53	25	28
12. Peer Oriented Learner	94	50	44
13. Learning With Adults	163	78	85
14. Learning Several Ways	97	54	43
15. Auditory Preferences	112	52	60
16. Visual Preferences	125	71	54
17. Tactile Preferences	88	40	48
18. Kinesthetic Preferences	-	-	-
19. Intake Required	12	8	4
20. Morning Best	109	55	54
21. Late Morning Best	109	59	50
22. Afternoon Best	66	35	31
23. Evening Best	17	10	7
24. Mobility Needed	9	5	4
Number of Students	285	143	142

LSI Variable 40 or Lower	Total	Sex M	Sex F
1. Quiet Preferred	36	19	17
2. Low Light	31	14	17
3. Cool Temperature	27	13	14
4. Informal Design	3	-	3
5. Not Self-Motivated	12	7	5
6. Not Adult-Motivated	81	42	39
7. Not Teacher-Motivated	27	13	14
8. Low Persistence	147	79	68
9. Low Responsibility	76	50	26
10. Structure Not Preferred	7	4	3
11. Learning Alone Not Preferred	75	41	34
12. Not Peer Oriented	45	21	24
13. Independent of Adults	76	38	38
14. Several Ways Not Preferred	17	11	6
15. No Auditory Preferences	20	12	8
16. No Visual Preferences	11	6	5
17. No Tactile Preferences	28	12	16
18. No Kinesthetic Preferences	44	26	18
19. Intake Not Required	203	103	100
20. Morning Not Best	33	14	19
21. Late Morning Not Best	102	49	53
22. Afternoon Not Best	67	36	31
23. Evening Not Best	19	9	10
24. Mobility Not Needed	63	24	39
Number of Students	285	143	142

Table IV.

APPENDIX D

Comparison of Total Number of LSI Responses With Number of LSI Responses per Grade Level

LSI Variable 60 or Higher	Total	School A	School B	School C
1. Sound Preferred	14	7	5	2
2. Bright Light	67	34	21	12
3. Warm Temperature	80	36	24	20
4. Formal Design	142	53	57	32
5. Self-Motivated	-	-	-	-
6. Adult-Motivated	-	-	-	-
7. Teacher-Motivated	-	-	-	-
8. High Persistence	45	23	13	9
9. High Responsibility	43	19	18	6
10. Needs Structure	115	58	33	24
11. Prefers Working Alone	53	19	22	12
12. Peer Oriented Learner	94	60	24	10
13. Learning With Adults	163	94	49	20
14. Learning Several Ways	97	56	32	9
15. Auditory Preferences	112	47	37	28
16. Visual Preferences	125	70	35	20
17. Tactile Preferences	88	49	26	13
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	12	2	4	6
20. Morning Best	109	80	21	8
21. Late Morning Best	109	69	30	10
22. Afternoon Best	66	39	18	9
23. Evening Best	17	-	-	17
24. Mobility Needed	9	-	-	9
Number of Students	285	140	91	54

LSI Variable 40 or Lower	Total	School A	School B	School C
1. Quiet Preferred	36	14	13	9
2. Low Light	31	4	16	11
3. Cool Temperature	27	14	9	4
4. Informal Design	3	1	1	1
5. Not Self-Motivated	12	8	2	2
6. Not Adult-Motivated	81	39	26	16
7. Not Teacher-Motivated	27	8	15	4
8. Low Persistence	147	74	46	27
9. Low Responsibility	76	30	29	17
10. Structure Not Preferred	7	2	5	-
11. Learning Alone Not Preferred	75	48	22	5
12. Not Peer Oriented	45	16	17	12
13. Independent of Adults	76	23	26	27
14. Several Ways Not Preferred	17	8	6	3
15. No Auditory Preferences	20	9	8	3
16. No Visual Preferences	11	3	4	4
17. No Tactile Preferences	28	12	11	5
18. No Kinesthetic Preferences	44	24	14	6
19. Intake Not Required	203	105	63	35
20. Morning Not Best	33	3	15	15
21. Late Morning Not Best	102	35	36	31
22. Afternoon Not Best	67	34	22	11
23. Evening Not Best	19	7	7	5
24. Mobility Not Needed	63	27	14	22
Number of Students	285	140	91	54

Code: Elementary - Grade 4, 5, 6; Junior High - Grade 7, 8; Senior High - Grade 9, 10

Table V.

APPENDIX D

Comparison of Total Number of LSI Responses With
Number of LSI Responses for Each Academic Achievement Level

LSI Variable 60 or Higher	Total	Achievement		
		Ex.	Av.	Below Av.
1. Sound Preferred	14	6	5	3
2. Bright Light	67	19	34	15
3. Warm Temperature	80	22	37	11
4. Formal Design	142	52	67	23
5. Self-Motivated	-	0	-	-
6. Adult-Motivated	-	0	-	-
7. Teacher-Motivated	-	0	-	-
8. High Persistence	45	21	17	7
9. High Responsibility	43	25	15	3
10. Needs Structure	115	36	57	22
11. Prefers Working Alone	15	14	32	7
12. Peer Oriented Learner	94	25	45	24
13. Learning With Adults	163	40	90	33
14. Learning Several Ways	97	32	52	23
15. Auditory Preferences	112	31	53	28
16. Visual Preferences	125	35	66	24
17. Tactile Preferences	88	27	42	19
18. Kinesthetic Preferences	-	-	-	-
19. Intake Required	12	5	5	2
20. Morning Best	109	39	51	19
21. Late Morning Best	109	27	54	27
22. Afternoon Best	66	18	36	12
23. Evening Best	17	5	7	5
24. Mobility Needed	9	3	3	3
Number of Students	285	87	140	58

LSI Variable 40 or Lower	Total	Achievement		
		Ex.	Av.	Below Av.
1. Quiet Preferred	36	15	18	3
2. Low Light	31	13	12	6
3. Cool Temperature	27	12	9	6
4. Informal Design	3	1	1	1
5. Not Self-Motivated	12	4	4	4
6. Not Adult-Motivated	81	25	36	20
7. Not Teacher-Motivated	27	9	12	6
8. Low Persistence	147	37	74	36
9. Low Responsibility	76	16	41	19
10. Structure Not Preferred	7	3	3	1
11. Learning Alone Not Preferred	75	19	36	20
12. Not Peer Oriented	45	12	25	18
13. Independent of Adults	76	32	31	13
14. Several Ways Not Preferred	17	4	8	5
15. No Auditory Preferences	20	5	12	3
16. No Visual Preferences	11	4	4	3
17. No Tactile Preferences	28	10	13	5
18. No Kinesthetic Preferences	44	13	23	8
19. Intake Not Required	203	64	100	39
20. Morning Not Best	33	10	20	3
21. Late Morning Not Best	102	44	43	15
22. Afternoon Not Best	67	23	32	12
23. Evening Not Best	19	6	8	5
24. Mobility Not Needed	63	32	23	8
Number of Students	285	87	140	58

Achievement Code: Ex. = Excellent; Av. = Average; Below Av. = Below-Average

Table VI. APPENDIX D

Comparison of Total Number of LSI Responses With
Number of LSI Responses for Each School Attendance Level

LSI Variable 60 or Higher	Total	Attendance High	Med	Low	LSI Variable 40 or Lower	Total	Attendance High	Med	Low
1. Sound Preferred	14	11	2	1	1. Quiet Preferred	36	25	8	3
2. Bright Light	67	46	16	5	2. Low Light	31	19	11	1
3. Warm Temperature	80	50	27	3	3. Cool Temperature	27	18	6	3
4. Formal Design	142	89	42	11	4. Informal Design	3	2	1	-
5. Self-Motivated	-	-	-	-	5. Not Self-Motivated	12	6	6	-
6. Adult-Motivated	-	-	-	-	6. Not Adult-Motivated	81	54	21	6
7. Teacher-Motivated	-	-	-	-	7. Not Teacher-Motivated	27	11	14	2
8. High Persistence	45	26	15	4	8. Low Persistence	147	95	41	11
9. High Responsibility	43	30	12	1	9. Low Responsibility	76	51	17	8
10. Needs Structure	115	76	33	6	10. Structure Not Preferred	7	6	1	-
11. Prefers Working Alone	53	29	17	7	11. Learning Alone Not Preferred	75	48	23	4
12. Peer Oriented Learner	94	60	29	5	12. Not Peer Oriented	45	26	13	7
13. Learning With Adults	163	100	44	19	13. Independent of Adults	76	50	23	3
14. Learning Several Ways	97	58	29	10	14. Several Ways Not Preferred	17	13	3	2
15. Auditory Preferences	112	70	35	7	15. No Auditory Preferences	20	8	11	1
16. Visual Preferences	125	83	32	10	16. No Visual Preferences	11	8	3	-
17. Tactile Preferences	88	51	30	7	17. No Tactile Preferences	28	14	12	2
18. Kinesthetic Preferences	-	-	-	-	18. No Kinesthetic Preferences	44	28	14	2
19. Intake Required	12	7	5	-	19. Intake Not Required	203	123	61	19
20. Morning Best	109	63	31	15	20. Morning Not Best	33	21	12	-
21. Late Morning Best	109	71	29	9	21. Late Morning Not Best	102	67	30	5
22. Afternoon Best	66	40	16	10	22. Afternoon Not Best	67	44	19	4
23. Evening Best	17	14	3	-	23. Evening Not Best	19	8	8	3
24. Mobility Needed	9	8	1	-	24. Mobility Not Needed	63	41	20	2
Number of Students	185	178	84	23	Number of Students	285	178	84	23

Attendance Category Code: High = 80% - 100%; Medium = 60% - < 80%; Low = < 60%.

APPENDIX E

Suggestions for Adapting Teaching Strategies

LEARNING STYLE INVENTORY

An Inventory for the Identification of How
Individuals in Grades 3 through 12
Prefer to Learn

LSI Manual

by

Rita Dunn, Ed.D.
Kenneth Dunn, Ed.D.
Gary E. Price, Ph.D.

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Price Systems, Inc., P.O. Box 3271, Lawrence, Ks. 66044

1. SOUND

For standard score of 60 or higher, provide soft music, conversation areas, or an open learning environment.

For standard score of 40 or lower, establish silent areas; provide individual alcoves with soundproofing; provide "earphones" to absorb sound.

2. LIGHT

For standard score of 60 or higher, place student near window, under adequate illumination; add table or desk lamps.

For standard score of 40 or lower, create learning spaces under indirect or subdued light away from windows; use dividers or plants to block or diffuse light.

3. WARMTH

For standard score of 60 or higher, provide adequate heating, enclosures, screens, supplemental heaters and placement in warmer areas; allow sweaters.

For standard score of 40 or lower, provide adequate air-conditioning, ventilation, and placement in cooler areas; permit short sleeved shirts, shorts, etc.

4. FORMAL DESIGN

For standard score of 60 or higher, create "formal" climate--rows of desks, straight chairs, stark walls and lighting.

For standard score of 40 or lower, provide "informal" climate--soft chairs and couches, pillows, some colour, lounge furniture, plants, etc.

5. SELF-MOTIVATED

For standard score of 600 or higher, encourage use of self-designed objectives, procedures and evaluation before the teacher assesses effort; permit self pacing and rapid achievement.

For standard score of 40 or lower, design short-term, simple, uncomplicated assignments that require frequent discussions with the teacher; provide several easily understood options based on the individual's interests; experiment with short-range motivators and reinforcement; develop peer relationships with able, motivated individuals; solicit self-developed goals and procedures; log results and progress.

6. ADULT-MOTIVATED

For standard score of 60 or higher, establish den area near teacher (unless student is adult but not teacher-oriented); praise often; send communications to home (notes, commentary, tapes, student's work); praise in front of adults; involve with other adults when working.

For standard score of 40 or lower, allow student to study by him/herself. Do not force student to work with adults. Use intrinsic motivation for outcomes rather than how it will make others feel.

7. TEACHER-MOTIVATED

For standard score of 60 or higher, establish den area near teacher; praise often; incorporate reporting to teacher into prescription; include in small-group instructional techniques when teacher is involved.

For standard score of 40 or lower, allow student to study by him/herself. Do not force student to work with the teacher. Use intrinsic motivation for outcomes rather than how it will make the teacher feel if one does a good job.

8. PERSISTENCE

For standard score of 60 or higher, design long-term assignments; provide supervision and assistance only when necessary; suggest when help may be obtained if necessary; praise at completion of assignment.

For standard score of 40 or lower, provide short-term, limited assignments; check and log progress frequently; provide options based on individual's interests; experiment with short-range motivators and reinforcement; develop peer relationships with able, persistent individuals; praise during process of completion of tasks; encourage self-design of short tasks.

9. RESPONSIBILITY

For standard score of 60 or higher, begin by designing short-term assignments; as these are successfully completed, gradually increase their length and scope; challenge the individual at the level of his or her functional ability or slightly beyond.

For standard score of 40 or lower, design short-term, limited assignments with only single or dual goals; provide few options and frequent checking by the teacher; directions should be simple and responsible peers should be placed in the immediate environment and on the same projects. Base assignments on interests and use interim praise or rewards.

10. STRUCTURE

For standard score of 60 or higher, be precise about every aspect of the assignment; permit no options; use clearly stated objectives in a very simple form; list and itemize as many things as possible, leaving nothing for interpretation; clearly indicate time requirements and the resources that may be used; required tasks should be indicated; as successful completion is evidenced, gradually lengthen the assignment and provide some choices from among approved alternative procedures; gradually increase the number of options; establish specific learning and reporting patterns and criteria as each task is completed.

For standard score of 40 or lower, establish clearly stated objectives but permit choices of resources, procedures, time lines, reporting, checking, etc.; permit choices of environmental, sociological, and physical elements; provide creative options and opportunities to grow and to stretch talents and abilities; review work at regular intervals but permit latitude for completion if progress is evident.

11. PREFERS LEARNING ALONE

For standard score of 60 or higher, encourage use of self-designed objectives, procedures and evaluations before the teacher assesses effort; permit self-pacing and achievement beyond department goals; encourage creativity if it exists.

For standard score of 40 or lower, pair or team this person with peer-oriented or authority-oriented individuals that complement his/her sociological characteristics, e.g., prefers to work with peers, is team-oriented with a small group, and so on.

12. PEER ORIENTED LEARNER

For standard score of 60 or higher, encourage peer meetings and planning; permit these students to evaluate each other individually and in groups; seek group suggestions and recommendations.

For standard score of 40 or lower, identify this person's sociological characteristics and permit isolated achievement if self-oriented, working with teacher if authority-oriented, or multiple options if learning in several ways is indicated.

13. LEARNING WITH ADULTS

For standard score of 60 or higher, place these students near appropriate teachers and schedule numerous meetings among them; plan to visit and check assignments often.

For standard score of 40 or lower, identify the student's sociological characteristics and permit isolated achievement if self-oriented, peer groupings if peer-oriented, or multiple options if learning in several ways is indicated.

14. PREFERS LEARNING THROUGH SEVERAL WAYS

For standard score of 60 or higher, provide opportunities for a variety of learning patterns for the same student, i.e., alone, with peers, with teachers or adults.

For standard score of 40 or lower, permit the person to learn in the sociological patterns indicated. If none are strong, permit options. Recheck self-orientation and motivation, responsibility and persistence.

15. AUDITORY PREFERENCES

For standard score of 60 or higher, use tapes, videotapes, records, radio, television, and precise oral directions when giving assignments, setting tasks, reviewing progress, using resources, or for any aspect of the task requiring understanding, performance, progress, and/or evaluation.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as fideotapes, filmstrips, television, and tactual/kinesthetic materials.

16. VISUAL PREFERENCES

For standard score of 60 or higher, the pictures, filmstrips, films, graphs, single concept loops, transparencies, diagrams, drawings, books, and magazines; provide resources that require reading and seeing; use programmed learning (if in need of structure) and written assignments and evaluations.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and tactual/kinesthetic materials.

17. TACTILE PREFERENCES

For standard score of 60 or higher, use manipulative and three-dimensional materials; resources should be touchable as well as readable; allow these individuals to plan, demonstrate, report, and evaluate with models and other real objects; encourage them to keep written records.

For standard score of 40 or lower, use resources prescribed under the perceptual preferences that are strong. If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and real-life experiences such as visits, interviewing, building, designing, and so on.

18. KINESTHETIC PREFERENCES

For standard score of 600 or higher, provide opportunities for real and active experiences for planning and carrying out objectives; site visits, seeing projects in action and becoming physically involved are appropriate activities for these individuals.

For standard score of 40 or lower, use resources prescribed under the preferences that are strong.

If none are 60 or more, use several multisensory resources such as videotapes, filmstrips, television, and tactual/manipulative materials.

19. REQUIRES INTAKE

For standard score of 60 or higher, provide frequent opportunities for nutritious food breaks, food at learning station, coffee at desk, and so on.

For standard score of 40 or lower, no special arrangements are needed.

20. FUNCTIONS BEST IN MORNING

For standard score of 60 or higher, permit scheduling of difficult assignments in morning. Take advantage of the strongest segment of the energy curve for morning. If possible, allow self-scheduling of learning activities if desired by student.

For standard score of 40 or lower, permit scheduling of difficult assignments in evening. Take advantage of the strongest segment of the time energy curve for evening. If possible, allow self-scheduling later in the day if desired by student.

21. FUNCTIONS BEST IN LATE MORNING

For standard score of 60 or higher, permit scheduling of difficult assignments in late morning. Take advantage of the strongest segment of the energy curve for late morning.

For standard score of 40 or lower, permit scheduling of difficult assignments in the strongest segment of the energy curve.

22. FUNCTIONS BEST IN AFTERNOON

For standard score of 600 or higher, permit scheduling of difficult assignments in afternoon. Take advantage of the strongest segment of the energy curve for afternoon.

For standard score of 40 or lower, permit scheduling of difficult assignments in the strongest segment of the energy curve.

23. FUNCTIONS BEST IN EVENING

For standard score of 60 or higher, permit self-scheduling of tasks in the evening. Take advantage of the strongest segment of the energy curve for evening.

For standard score of 40 or lower, allow student to schedule work in evening. Schedule learning activities later in the day rather than in the evening. Utilize the strongest segment of the energy curve.

24. NEEDS MOBILITY

For standard score of 60 or higher, provide frequent breaks, assignments that require movement to different locations, and schedules that build mobility into the work/learning pattern, require results, not immobility.

For standard score of 40 or lower, provide stationary desk or learning station where most of the student's responsibilities can be completed without requiring excessive movement.